Aug. 2, 1938.

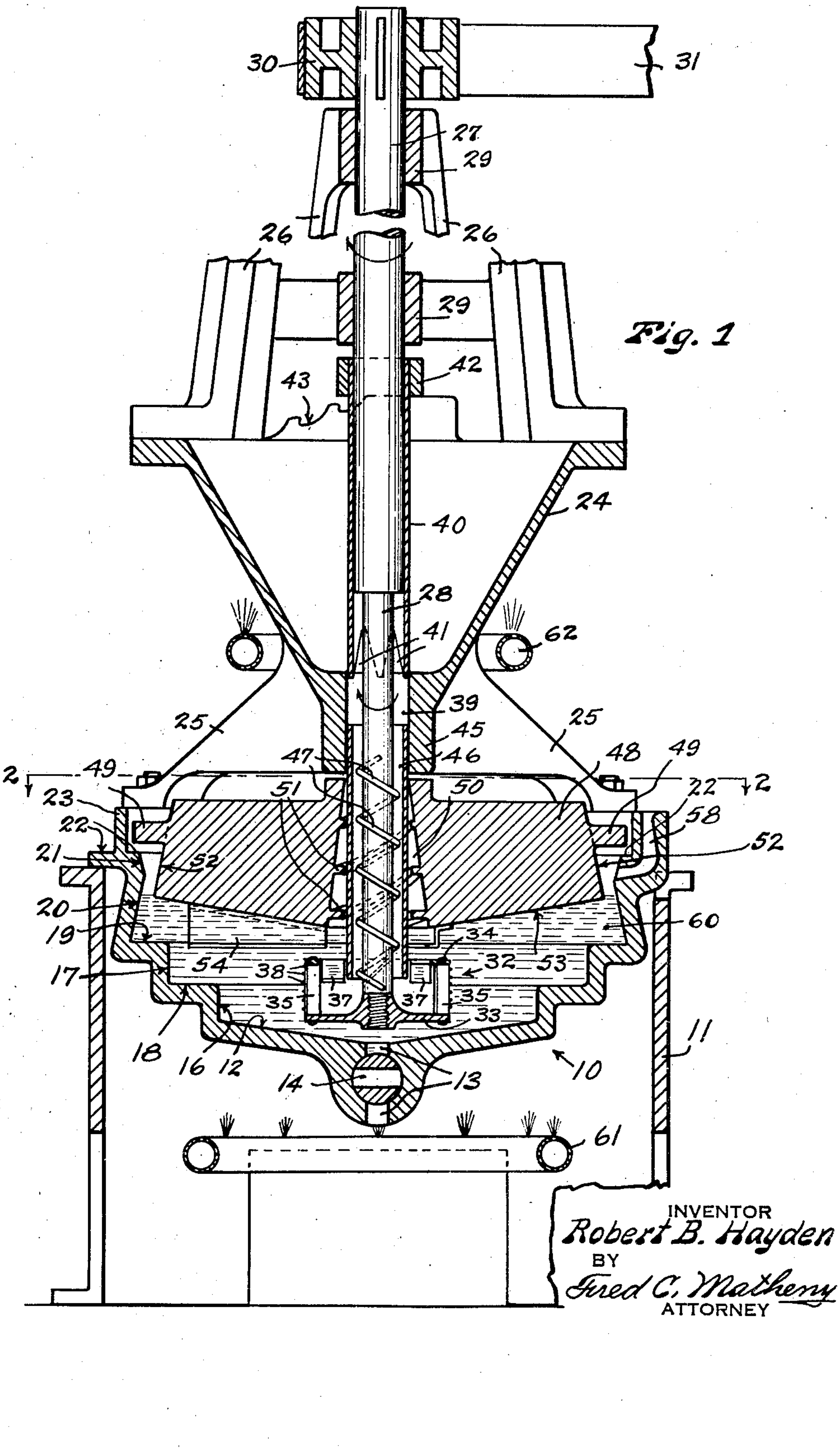
R. B. HAYDEN

2,125,291

PRECIOUS METAL RECOVERY DEVICE

Original Filed Feb. 11, 1935

2 Sheets-Sheet 1

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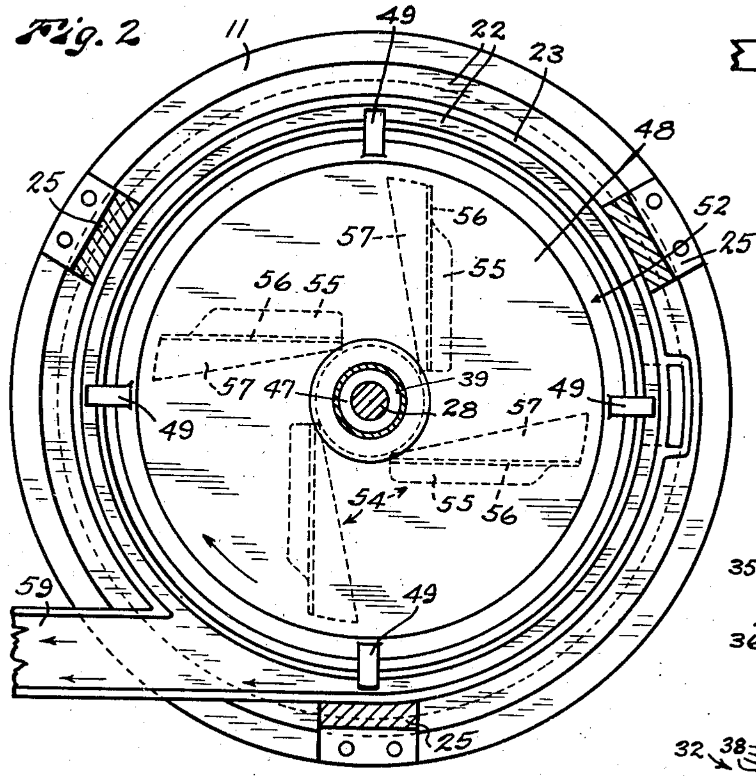


Fig. 2

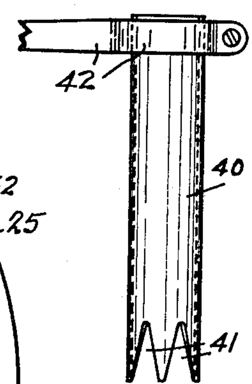


Fig. 3

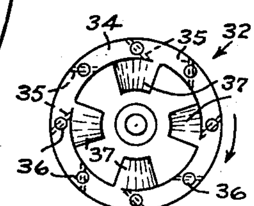


Fig. 4

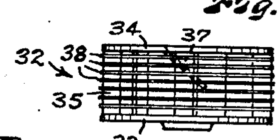


Fig. 5

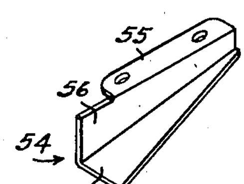


Fig. 6

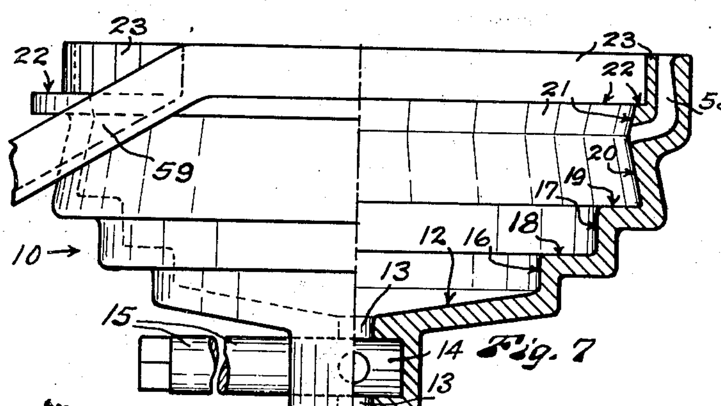


Fig. 7

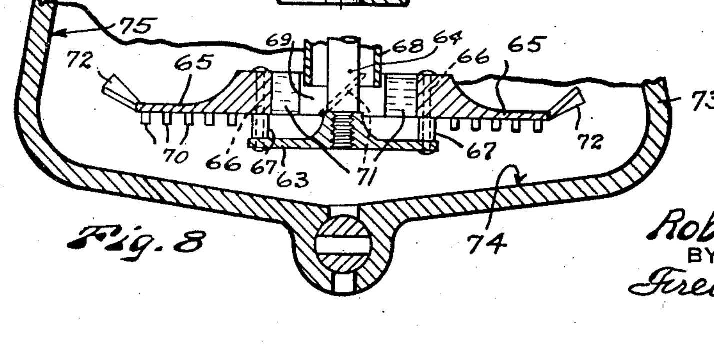


Fig. 8

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# UNITED STATES PATENT OFFICE

2,125,291

## PRECIOUS METAL RECOVERY DEVICE

Robert B. Hayden, Seattle, Wash.

Application February 11, 1935, Serial No. 6,025
Renewed November 1, 1937

12 Claims. (Cl. 209—184)

This invention relates to means for and methods of extracting precious metals from finely divided ores, black sands and other finely divided value bearing material.

A primary object of this invention is to provide an efficient means for and method of extracting precious metals from ores which have been ground to a fineness which releases the precious metals or from other finely divided materials in which the precious metals occur in a free state.

Another primary object of the invention is to provide means for and a method of extracting precious metals from finely divided concentrated material by bringing said material into intimate contact with molten lead.

Another primary object of the invention is to provide means for extracting precious metals from finely divided concentrated material, which means may take the place of smelting at a much lower cost and with a much more efficient recovery of values.

Another primary object of this invention is to provide efficient means for extracting precious metals from finely divided value bearing material, which means is relatively inexpensive to manufacture and operate; is small and compact in construction and readily transported to locations difficult of access, thereby saving expense incurred in the shipment of concentrated material to smelters; is capable of saving a very high percentage of all of the precious metals in ores or concentrates; and is capable of being successfully operated by persons of ordinary skill.

It is well known that a substantial amount of values are lost in smelting processes by being carried away with the smoke and by-products of combustion. My invention overcomes this difficulty and saves a large percentage of the values ordinarily lost in this manner in smelting and at the same time provides a less expensive process of extraction.

A still further object of this invention is to prevent losses of lead and values due to oxidation in the course of the extraction treatment and to provide a method and means applicable to substantially all finely divided concentrates and ores including complex ores.

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

In the drawings, Fig. 1 is a view in vertical midsection, with parts shown in elevation, of a precious metal extraction device constructed in accordance with this invention.

Fig. 2 is a view of the same partly in plan and partly in section substantially on broken line 2—2 of Fig. 1.

Fig. 3 is a detached elevation of a tubular feed valve embodied in the invention.

Fig. 4 is a detached plan view of a mixing impeller embodied in the invention.

Fig. 5 is a side elevation of said mixing impeller.

Fig. 6 is a detached perspective view of a vane used on the bottom of a rotatably mounted float.

Fig. 7 is a view partly in section and partly in elevation of a mixing receptacle embodied in the invention.

Fig. 8 is a fragmentary sectional view illustrating a modified form of the invention.

Like reference numerals designate like parts throughout the several views.

Referring to the drawings, 10 designates a bowl shaped receptacle which is supported on a suitable upright housing like frame 11. The receptacle 10 is centrally provided with a relatively flat conical bottom portion 12 of slightly concave shape on the inside. The conical bottom 12 has a centrally positioned outlet opening 13 controlled by a rotary valve 14. The valve 14 may have a long stem 15 so that it may be operated from the exterior of the housing like frame 11. Extending around the flat conical bottom portion 12 and integral with the receptacle 10 are a plurality of annular upright shoulders 16 and 17. At their upper edges the shoulders 16 and 17 merge with annular flat shelf like portions 18 and 19 respectively. Extending upwardly from the outer edge of the flat shelf like portion 19 is an upper annular wall section 20 which is inclined inwardly to a point near the top of the receptacle and then has a short outwardly inclined portion 21 which terminates in a flat top portion 22. An annular vertical flange 23 extends upwardly from the flat top portion 22.

A feed hopper 24 is positioned above the receptacle 10 and preferably supported from the frame 11 by base members 25. The base members 25 may rest on and be secured to the top of the receptacle 10, the receptacle 10 being supported directly on the frame 11. An upper frame member 26 is supported on the feed hopper 24 and extends upwardly therefrom to a substantial distance above the hopper 24. A vertical shaft 27, having a lower end 28 of smaller diameter, is journaled in bearings 29 in the upper frame member 26 and extends downwardly through the feed hopper and into the receptacle 10. The upper frame member 26 is shown partially broken away in Fig. 1, but said upper frame member is preferably made long enough to afford a good bearing arrangement for the shaft **27** and to allow the upper end of said shaft to be positioned at a substantial distance above the hopper so that the driving connection at the upper end of said shaft will be less subject to the heat applied to the hopper and to the receptacle **10**. A belt pulley **30** on the upper end of the shaft **27** may be connected with a belt **31** by which the shaft is driven.

A mixing impeller, designated generally by **32**, is secured to the lower end of the shaft **27—28**. This mixing impeller embodies a disc like bottom member **33** having a central hub into which the lower end of the shaft **27—28** may be threaded. A ring like top member **34** is spaced above the disc like bottom member **33** and rigidly connected with said disc like bottom member **33** by peripherally disposed upright vanes **35**. These vanes **35** are flat and are positioned at an angle as respects radial planes of the impeller. The vanes **35** preferably have integral rivets **36** on the ends thereof which are riveted into the ring **34** and bottom member **33**. The function of these vanes is to direct and propel material outwardly toward the periphery of the receptacle **10**. Another set of vanes **37**, integral with or rigidly secured to the ring like top member **34**, are provided at the top of the mixing impeller and extend inwardly from the ring like top member **34** toward the axis of said mixing impeller. The vanes **37** are pitched like the blades of a propeller and are adapted to exert a downward force on material which enters the impeller from the top. Bands **38**, as of wire, extend circumferentially around the impeller in engagement with the upright vanes **35** and form screen like means for breaking up the material which is passing radially outward through the impeller. The disc like bottom member of the impeller is positioned a short distance above the bottom **12** of the receptacle **10**.

The shaft **27—28** is of larger diameter down to a location a short distance above the bottom of the feed hopper and the lower end portion **28** of said shaft is of smaller diameter to afford a material feed passageway **39**. A tubular feed control valve **40** is provided on the exterior of the shaft **27**. The lower end of the feed control valve **40**, Fig. 3, has upwardly extending feed notches **41** through which finely divided material may pass from the feed hopper **24** into the feed passageway **39** when the feed control valve **40** is elevated into a position, as shown in Fig. 1. The upper end of the feed control valve **40** has a lever **42** connected therewith. The lever **42** is angularly movable over an inclined notched segment **43** on the rim of the feed hopper and is adapted to raise and lower the feed control valve **40** and to hold said valve **40** in any desired adjusted position. In Fig. 1, the valve **40** is shown at the upper limit of its movement thus affording a maximum feed. By moving the lever **42** toward the lower end of the inclined notched segment **43** the feed will be decreased and said feed will be entirely cut off when the feed notches **41** are entirely within the passageway **39** in the hub portion **45** of the feed hopper **24**.

A feed tube **46** is secured within the opening **39** in the feed hopper hub **45** and extends downwardly into the mixing impeller **32** so as to deliver finely ground value bearing material directly into said mixing impeller. The ends of the vanes **37** preferably terminate in close proximity to the exterior of the feed tube **46**. The feed tube **46** is of substantially larger diameter than the lower end portion **28** of the impeller shaft and said shaft **28** is externally provided within the feed tube **46**, with a spiral thread or worm **47** which feeds ground material downwardly the the shaft rotates. This provides positive feed means for delivering the value bearing material into the mixing impeller.

Positioned within the upper portion of the receptacle **10** is a relatively large heavy float **48**. This float **48** is provided with a plurality of lugs **49** which project beyond the peripheral portion thereof and are adapted to rest on the top **22** portion of the receptacle **10** and support the float when the device is not in use. When the device is in operation the float **48** is supported on the molten lead. The float **48** has a conical central opening **50** through which the feed tube **46** extends. This opening **50** is only slightly larger than the exterior of the feed tube **46** at the top and said opening diverges or expands toward the bottom portion of the float. Spiral thread means **51** is provided within the conical opening **50**. This thread means **51** helps to prevent lighter material from being crowded up through the opening **50** by the heavier molten lead when the device is in use.

The peripheral walls **52** of the float **48** are inclined conically and convergently from bottom to top to conform to the incline of the upper wall section **20** of the receptacle **10**. The walls **52** of the float **48** are spaced from the walls **20** of the receptacle **10** to afford an annular passageway for the discharge of material which has been subjected to the action of the molten lead. The bottom of the float **48** is also of conical shape, as indicated at **53**, said bottom **53** being inclined upwardly from the center toward the periphery.

A plurality of vanes **54** are secured to the bottom of the float **48**. These vanes, see Figs. 1, 2 and 6 are not radial but are positioned substantially tangential to the bottom portion of the conical opening **50** and extend toward the periphery of the float. These vanes **54** preferably terminate just inwardly from the shoulder **17** of the receptacle **10** so that said vanes **54** may extend downwardly into the receptacle **10** inside of the shoulder **17**. These vanes **54** are preferably shaped, as more clearly shown in Fig. 6, to provide base portions **55** arranged to be bolted to the bottom of the float and vertical fin portions **56** and horizontal portions **57**. These vanes **54** form channels on the bottom of the slowly rotating float **48**, through which molten lead may flow back toward the axis of the machine and be delivered into the mixing impeller **32** on top of the incoming material from which the values are to be extracted.

An inlet opening **58** through which molten lead may be introduced is provided in the peripheral portion of the receptacle **10**.

A discharge spout **59** is provided at the top of the receptacle **10**. The discharge spout **59** is preferably substantially tangential to the top of the receptacle **10** and has an opening through the vertical flange **23** on the top of said receptacle **10**. The inner end of the discharge spout **59** is preferably level with the flat top portion **22** of the receptacle **10** and said discharge spout **59** is inclined downwardly toward the outer end. The float **48** floats on molten lead **60** within the receptacle **10** with the lugs **49** raised just clear of the shelf portions **22**. A rotary motion is imparted to the molten lead by the rotating impeller and this rotary motion is communicated to the float 48. The lugs 49 on the float 48 are moved around the receptacle 10 a short distance above the flat shelf portion 22 of said receptacle 10 and serve as means to sweep discharging material outwardly into said spout 59.

Receptacle heating means 61 is provided within the base frame 11 in operative relation with respect to the receptacle 10. This heating means 61 is of sufficient capacity to maintain the lead 60 within the receptacle 10 in a molten condition it being a characteristic of finely divided gold that it will liquefy at substantially 950 degrees Fahrenheit when it is brought into contact with molten lead. Another heating means 62 is also preferably provided for heating the material supply hopper 24 to keep the material in said hopper heated.

In Fig. 8 I have shown a modified form of my invention embodying a mixing impeller comprising a lower horizontal disc portion 63 secured to a rotating vertical shaft 64. An upper horizontal disc portion 65 of larger diameter than the disc portion 63 is secured to said disc portion 63, in spaced relation thereabove, by rivets 66 having spacer sleeves 67 thereon. A feed tube 68 extends downwardly around the shaft 64 and terminates in an opening 69 which is provided in the larger upper disc portion 65. The disc portion 65 is provided on the bottom surface with a plurality of downwardly extending spaced apart lugs 70 which agitate and thoroughly mix material and molten lead which are directed outwardly by the impeller. These lugs 70 very thoroughly agitate and mix the material to be separated because this material is lighter in weight than the molten lead and will continually tend to rise upwardly against the disc portion 65. Inclined vanes 71 are provided in the central portion of the disc 65. These vanes 71 help to force the material downwardly and outwardly. Other vanes 72 are provided on the peripheral portion of the disc 65. The vanes 72 are pitched so that they tend to force the material downwardly as it passes outwardly under said vanes. This secures a better mixing of the material with the molten lead.

A receptacle 73 of modified shape is also shown in Fig. 8, this receptacle 73 has a concave bottom 74 of flattened cone shape and side walls 75 which are convergent inwardly from the bottom toward the top.

When this extraction device is to be operated solid lead may be placed in the receptacle 10 and melted or molten lead may be poured into the receptacle 10 through the opening 58. Enough molten lead is provided to submerge the mixing impeller 32 and come into contact with the lower portion of the float 48. The receptacle 10 is heated hot enough to keep this molten lead in molten condition during operation. The feed control valve 40 may be closed while the feed hopper is filled or partially filled with finely divided or pulverized ore which carries values. This ore will usually have been previously roasted to condition it for the extraction treatment and may come directly from an ore roaster. It will also have a suitable flux mixed with it which has been determined in the usual manner by the character of the ore. The feed hopper 24 is maintained at a high enough temperature so that the material to be treated will not reduce the molten lead below the temperature necessary to liquefy the precious metals as it mixes therewith. The mixing impeller is then driven in the direction indicated by the arrows in Figs. 1 and 4 at a relatively high rate of speed and the feed control valve is opened to allow material to feed downwardly. For a mixing impeller of three inches over all diameter I find that a speed of about 1750 revolutions per minute, providing a peripheral speed of about 1400 feet per minute, gives satisfactory results but it will be understood that the angular and peripheral speed of this impeller may be varied depending on various factors, as the size and shape of the impeller, shape of receptacle and character of material being treated. The rapid rotation of the impeller produces an outward and a rotary motion of the molten lead in the receptacle 10 and causes the molten lead to rise higher at the circumference of the receptacle 10 and assume a somewhat conical shape characteristic of liquids when rotated in cylindrical receptacles. When the molten lead is rotated in this manner it will lift the float 48 so that the lugs 49 are clear of the shelf like portion 22 on which they may rest when the machine is not in operation. As the float is supported on the molten lead which is rotating in the receptacle the float will be caused to rotate at comparatively slow speed in the receptacle, due to the action of the rotating molten lead on the vanes 54. This molten lead is also being driven toward the periphery of the receptacle 10 by the mixing impeller 32 and it will flow upwardly along the outer receptacle walls and inwardly along the bottom of the float 48 between the vanes 54. This molten lead which flows inwardly between the vanes 54 will pour into the top of the impeller along with, and on top of, the incoming powdered value bearing material thus bringing the molten lead into intimate contact with the powdered material from which the values are to be extracted. The vanes 37 in the impeller will help to force this circulating molten lead down through the impeller and will keep the lighter value bearing material forced down and prevent it from rising through the impeller. The value bearing material is compelled to pass out through the periphery of the mixing impeller and is thoroughly mixed with the hot lead and gold and silver and all other precious metals having affinity for hot lead, will be absorbed and picked up and held by the molten lead. The agitation and whipping of the molten lead may cause a portion of the lead and especially that portion which has absorbed precious metals to flour or break up into small globules. This flouring may be due to the action of oxygen in the material being treated. This floured lead, which holds values, together with the finely divided lighter material or tailings will move outwardly along the inclined bottom 53 of the float 48 and will move upwardly between the internal wall of the receptacle and the external wall of the float 48 and will be discharged through the spout 59. Some of the values will ordinarily be retained in the molten lead in the receptacle which does not flour off.

The molten lead covered by the float 48 will not be exposed to the air and will be protected against oxidation. The portions of molten lead toward the center and toward the periphery which are not covered by the float will be covered by the powdered material or tailings and will be protected from oxidation by exposure to the air.

In the floured lead and tailings thus discharged some of the values will be held by the floured lead. The floured lead may then be separated from the tailings in any well known manner, as by passing the same over a concentrating table or by subjecting said floured lead and tailings to a selective oil flotation process.

The floured lead with the values in it may then be treated to recover the values. I find that one method of recovering the values from this floured lead with a minimum loss of lead is to place the same in a receptacle, heat to a molten state and agitate the molten mass. I find that agitation for a period of ten minutes is ordinarily sufficient. This will cause the values to rise to the top while the lead which does not carry values will be left in the bottom of the receptacle. During this process the surface of the molten mass is covered with powdered lime rock or with any powdered material which will prevent oxidation. By providing a valve in the bottom of the receptacle it is possible to draw off first the molten lead which does not carry values and then the molten lead which carries the values. The molten lead carrying the concentrated values may be separatedly collected and later treated in such a manner as to recover the values. Well known treatments for the recovery of the concentrated values may be used. These treatments usually involve the destruction or loss of what lead remains in the concentrated matter.

The re-melting, agitation and final concentration of the lead containing the values may be done in the receptacle 10, preferably with the float 48 removed, and the lead drawn off through the valve 14 or a separate receptacle similar to the receptacle 10 may be provided for this remelting agitation and final concentration. It is also possible to allow this lead containing the concentrated values to cool and solidify after it has been re-melted and agitated and the values caused to rise to the top. If this is done the values which have been caused to rise to the top will not settle but will remain stratified at the top of the cooled, solidified lead ingot and this value bearing top portion may be cut off and treated for the recovery of the values. When the values are thus caused to concentrate at the top of the molten lead it is found that there will be very little of the values left in the lead at the bottom. If any values are left in the lead in the bottom of the receptacle they will not be lost as this lead is returned to the receptacle 10 and used over and over again. The values which stay in the molten lead in the receptacle 10 may be recovered from this lead in a manner similar to that above described after the lead in the receptacle holds a substantial amount of values which do not flour off. New lead may be added to the receptacle from time to time to replace the lead which flours off.

It has heretofore been found difficult to recover values from finely divided ore bearing concentrates by the use of molten lead on a scale large enough for commercial use. My invention provides a machine which may be used commercially at a great saving as compared to the usual smelting processes. This machine is efficient in its extraction of values, not expensive to manufacture and easy to operate.

The foregoing description and accompanying drawings clearly disclose what I now regard as 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.

I claim:

1. In a mineral extraction device, a heated molten lead receptacle; molten lead in said receptacle; a driven rotary mixing impeller positioned in the molten lead in said receptacle; said impeller having an open center; a float in said receptacle floating in the molten lead and positioned above said impeller; the bottom of said float being conically inclined upwardly from the center outwardly and said bottom float wall exerting a substantial pressure on the molten lead whereby material moving outwardly between said float and said molten lead will be subjected to pressure rolling and rubbing said material into said molten lead; and material feed means extending down through said float and connected with the open center of said impeller.

2. In a mineral extraction device, a cylindrical heated molten lead receptacle; molten lead within said receptacle; a driven rotary mixing impeller having a central material intake opening and peripherally directed material discharge openings and positioned within the lower portion of said receptacle; upright tubular feed conduit means communicatively connected with the material intake openings of said impeller; and a relatively heavy float positioned in said receptacle and floating in the molten lead and forming a top wall spaced above said rotary impeller, the bottom of said float being conically inclined upwardly from the center outwardly and said float bottom exerting a substantial pressure on the molten lead whereby value bearing material moving outwardly between said float bottom and said molten lead will be subjected to rubbing and rolling pressure, the periphery of said float being spaced from the walls of said receptacle affording a material discharge outlet.

3. In a mineral extraction device, a heated cylindrical molten lead receptacle; molten lead in said receptacle; a driven rotary mixing impeller positioned in the lower portion of said receptacle, said impeller having an open periphery and a hollow central portion; vanes provided in said hollow central portion forcing material downwardly in response to rotation in one direction of said impeller, other vanes provided in said open peripheral portion forcing material outwardly in response to rotation in the same direction of said impeller; means rotating said impeller at a high rate of speed throwing the molten lead out of said impeller; and an upright tubular feed conduit connected with the hollow central portion.

4. In a mineral extraction device, a heated cylindrical molten lead receptacle; molten lead in said receptacle; a driven rotary mixing impeller positioned within said receptacle and having a central material intake opening and peripherally directed material discharge openings; upright tubular feed conduit means communicatively connected with the material intake opening of said impeller; a relatively heavy float positioned in said receptacle forming a top wall spaced above the top of said rotary impeller, the periphery of said float being spaced from the walls of said receptacle affording a discharge outlet for material; and vanes on the bottom of said float extending from the central toward the peripheral portion thereof.

5. In a mineral extraction device, a cylindrical receptacle; heating means operatively connected with said receptacle; molten lead in said receptacle; an upright shaft extending down into said receptacle; driving means connected with said shaft; a mixing impeller secured to the lower end portion of said shaft, said mixing impeller having a screen like peripheral portion and a hollow central portion; a feed hopper positioned above

said receptacle; a feed tube communicatively connecting said feed hopper and said mixing impeller, said shaft extending through said feed tube; a feed screw on said shaft within said feed tube; a circular float positioned in said receptacle above said mixing impeller, the circumferential walls of said float being spaced a short distance from the walls of said receptacle to provide a discharge outlet for material; and vanes on the bottom of said float extending from the central portion of the float outwardly.

6. In a mineral extraction device, a cylindrical receptacle; heating means operatively connected with said receptacle; molten lead in said receptacle; an upright shaft extending down into said receptacle; driving means connected with said shaft; a mixing impeller secured to the lower end portion of said shaft, said mixing impeller having a screen like peripheral portion and an open central portion; a feed tube communicatively connected with said mixing impeller, said shaft extending through said feed tube, a feed screw on said shaft within said feed tube; a circular float rotatively mounted in said receptacle above said mixing impeller and floated on the molten lead when the machine is in operation, the circumferential walls of said float being spaced a short distance from the walls of said receptacle to provide a discharge outlet for material; and vanes on the bottom of said float extending from the central portion of the float outwardly.

7. In a mineral extraction device, a receptacle having a plurality of annular upright shoulders in the bottom thereof; receptacle heating means; a driven rotary mixing impeller disposed in the portion of said receptacle surrounded by said annular shoulders, said mixing impeller having a hollow center and having peripheral openings; means rotating said impeller at a high rate of speed throwing the molten lead outwardly from said impeller against said annular upright shoulders; float means forming a top wall above said mixing impeller, the bottom of said float means being conically inclined upwardly from the center outwardly; molten lead in said receptacle submerging said impeller and contacting and supporting said float means; and material feed means communicatively connected with said mixing impeller, said float means exerting a substantial pressure on the molten lead whereby material between said float means and said molten lead will be spread out into a thin film and rubbed between said float means and the molten lead.

8. In a mineral extraction device, a receptacle; having a peripheral wall section which is inclined conically and convergently from the lower toward the upper portion of said receptacle; receptacle heating means; a driven rotary mixing impeller disposed in the lower portion of said receptacle, said mixing impeller having a hollow center and having peripheral openings; float means forming a top wall above said mixing impeller; the peripheral walls of said float being inclined to conform to the incline of said conical receptacle walls and being spaced from said control receptacle walls to provide an annular outlet opening; molten lead in said receptacle submerging said mixing impeller and contacting said float means; and material feed means communicatively connected with said mixing impeller.

9. In a mineral extraction device, a receptacle; having a peripheral wall section which is inclined conically and divergently from the upper toward the lower portion of said receptacle and having a plurality of annular upright shoulders in the bottom thereof; receptacle heating means; a driven rotary mixing impeller disposed in the portion of said receptacle surrounded by said shoulders; said mixing impeller having a hollow center and having peripheral openings; float means forming a top wall above said mixing impeller; the peripheral walls of said float being inclined to conform to the incline of said conical receptacle walls and being spaced from said conical receptacle walls; molten lead in said receptacle submerging said impeller and contacting said float means; and material feed means communicatively connected with said mixing impeller.

10. In a mineral extraction device, a receptacle, receptacle heating means; molten lead in said receptacle; a driven rotary impeller positioned in the lower portion of said receptacle; said rotary impeller having material passageway means extending from the upper axial portion to the peripheral portion thereof; upright feed tube means communicatively connected with said mixing impeller; a float member rotatively supported in said receptacle above said impeller, said float member having a cone shaped axial opening expanding from the upper end downwardly and fitting over said feed tube means; spiral thread means in said cone shaped opening; and vanes on the bottom side of said float substantially tangential to said conical opening.

11. In a mineral extraction device; a receptacle, receptacle heating means; molten lead in said receptacle; a driven rotary impeller positioned in the lower portion of said receptacle, said rotary impeller having material passageway means extending from the upper axial portion to the peripheral portion thereof; upright feed tube means communicatively connected with said mixing impeller; a float member rotatively supported in said receptacle above said impeller and having a central opening through which said feed pipe extends, the peripheral walls of said float member being spaced from the surrounding walls of said receptacle affording an outlet opening for material; lugs projecting from the periphery of said float member; and an annular shelf on said receptacle on which said lugs may rest, said float resting on the molten lead in the receptacle when the machine is in operation.

12. In a mineral extraction device, a receptacle, receptacle heating means; molten lead in said receptacle; a driven rotary impeller positioned in the lower portion of said receptacle, said rotary impeller having material passageway means extending from the upper axial portion to the peripheral portion thereof; upright feed tube means communicatively connected with said mixing impeller, a float member rotatively supported in said receptacle above said impeller and having a central opening through which said feed pipe extends, the peripheral walls of said float member being spaced from the surrounding walls of said receptacle affording an outlet opening for material, said float member having a cone shaped bottom portion contacting the molten lead in said receptacle; and vanes on said cone shaped float bottom extending from the central portion thereof outwardly.

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