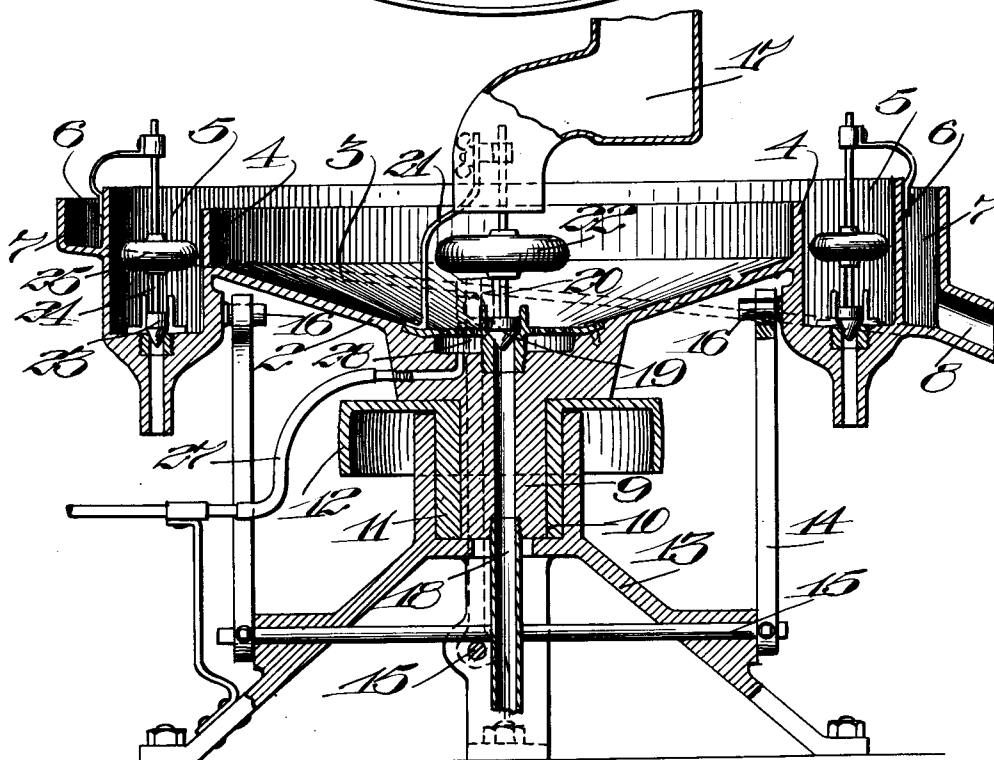
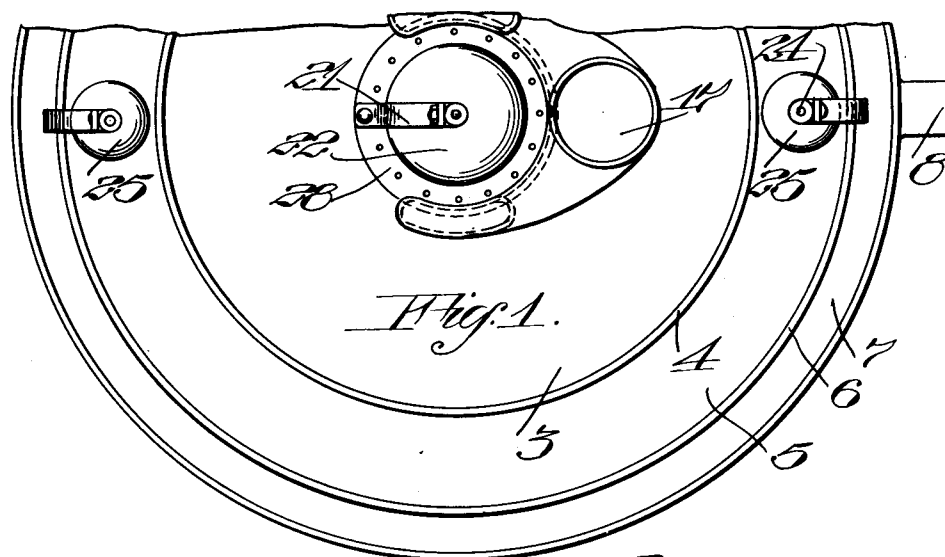


W. W. WHITTON.
CONCENTRATOR.
APPLICATION FILED NOV. 23, 1911.

1,065,288.

Patented June 17, 1913.

2 SHEETS—SHEET 1.



Witnesses:
Jas. Lashberg
A. S. Boney

Fig. 2.

Inventor:
William W. Whitton
by G. H. Strong

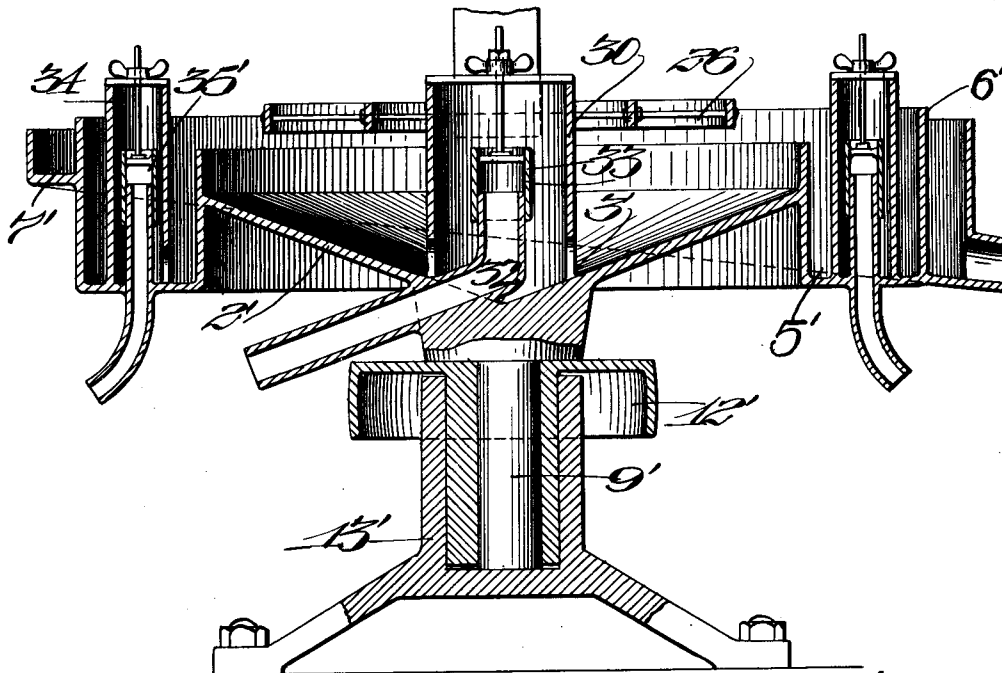
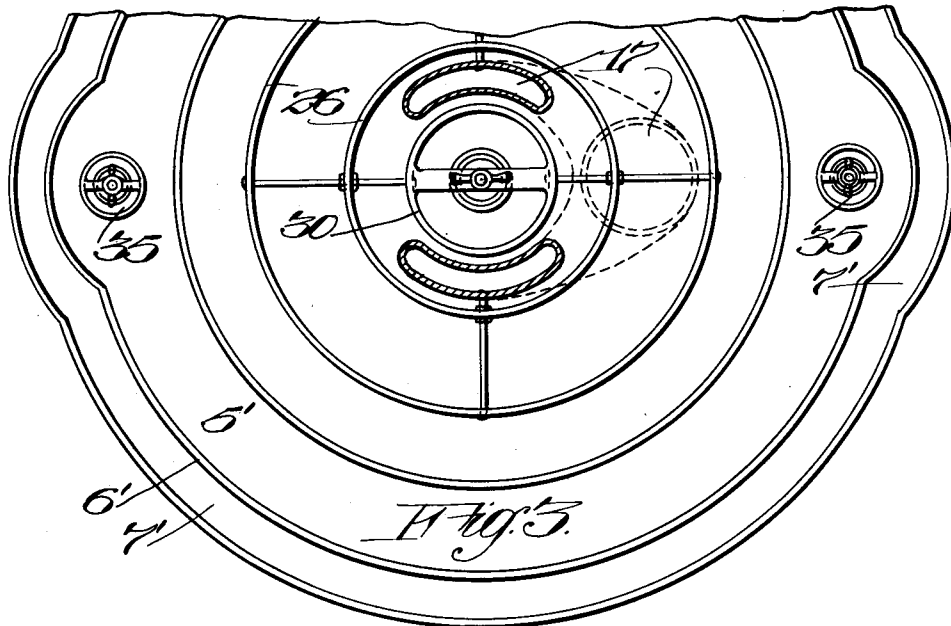
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2 SHEETS—SHEET 2.

1,065,288.



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Fig. 4.

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Att'y.

UNITED STATES PATENT OFFICE.

WILLIAM W. WHITTON, OF GOLDFIELD, NEVADA.

CONCENTRATOR.

1,065,288.

Specification of Letters Patent.

Patented June 17, 1913.

Application filed November 23, 1911. Serial No. 661,951.

To all whom it may concern:

Be it known that I, WILLIAM W. WHITTON, a citizen of the United States, residing at Goldfield, in the county of Esmeralda and State of Nevada, have invented new and useful Improvements in Concentrators, of which the following is a specification.

The object of the invention is to provide a concentrator of few parts and simple construction, which is adapted to operate continuously during the feeding of pulp to discharge the separated grades of the ore and tailings, and which separation will occur automatically during the running of the machine.

It is also a purpose of the invention to design and provide a concentrating apparatus comprising a pan of suitable proportions so mounted that it can be bodily swung in an orbit and which pan is prevented from having a rotary motion about its own center.

A further purpose of the invention is to provide and devise a concentrating machine in which the many elements will be given a gyratory motion having the effect of stratifying the various components of the ore, so that these components will be automatically settled in a relative position determined by their specific gravities; the machine being adapted to discharge the heavier components of the ore through one discharge opening, and being provided with a series of compartments designed to further separate the ore into grades, which will be determined by the specific gravity of the several components of the ore. The machine will also make a satisfactory separation of middlings, and can also be made to deliver several products. On certain ores it will make possible a far better separation of zinc and lead than is now accomplished. There is a strong demand and a real need for a machine that will accomplish this. The machine will not separate these two metals when they are in molecular contact; this is hardly possible by any means of wet, dry or magnetic treatment, but where they can be free from each other by crushing, it will be far superior to all present devices.

The invention consists of the parts and the construction and combination of parts, as hereinafter more fully described and claimed, having reference to the accompanying drawings, in which—

Figure 1 is a plan view of one form of my concentrator. Fig. 2 is a central ver-

tical section of the same. Fig. 3 is a plan view of another form of the concentrator. Fig. 4 is a central vertical section of the same.

This machine is an adaptation of the well-known miner's pan, and in addition to being employed in a novel form, a new and reliable device is employed for automatically withdrawing the concentrates from the pan while the tailings are discharged at its outer edge, and the construction of the present pan is designed to allow a multiple separation of the several components contained in the ore being treated.

In the embodiment of my invention shown in Figs. 1 and 2, I employ a pan of suitable design and proportion, which is here shown as being in the form of a casting or body 2, having a central conical depression 3. About the upper edge of this depression 3 is provided a wall 4 of suitable height and this wall forms one side of an annular chamber, indicated at 5, having an outer wall 6, which is surrounded by a launder 7 having an inclined bottom terminating in a discharge projection 8 on one side of the pan body 2. While I have shown the pan body 2 as substantially circular in plan, its form may be varied as occasion or conditions may determine. The pan is here shown as being provided at its lowermost central portion with a downwardly projecting stem 9 which is fitted in a bore 10 formed eccentrically in a hub 11 of a driving wheel 12. The driving wheel 12 is suitably supported in a stationary bearing or frame 13. Since the pan boss or stem 9 is eccentrically mounted within the pulley hub 11, if the hub be revolved, it will carry the stem 9 in a circle about the axis of the hub 11, and in order to prevent the pan 2 from revolving with the pulley 12, I provide a suitable mechanism, which is here shown as comprising one or more U-frames 14, having a rocker shaft 15 journaled in the frame or base 13; the upwardly extending arms 14 of the frame being adapted to receive gudgeons 16, which are attached to, or formed upon, the pan 2 at suitable intervals. The function of the rocking frame 14 is to prevent the rotation of the pan 2 with the pulley 12, when the latter is revolved, and by the introduction of the rocking frame 14 when the pulley 12 is revolved and its hub 11 moving about the axis of the pulley, the eccentric stem 9 of the pan 2 will be restrained from axial rotation, but the pan

will be permitted to shift laterally of the frame 13 by means of the gudgeons 16, which slide in the upright arms of the frame 14. This lateral movement or sliding action of the pan gudgeons 16 upon the upright frame 14 permits the pan to shift from one side of the center of the hub 11 to the opposite side, due to its eccentricity in the hub 11, and the oscillating movement of the frame arms 14, due to the rocking of the shaft 15, permits the orbital movement of the pan 2. In other words, the rocking of the uprights 14, due to the motion in one direction of the pan 2 and the sliding of the pan 2 upon the uprights 14, permit the latter to make a circular orbital movement relative to the frame 13, but the pan 2 has no circular or revolving motion about its own axis. It will thus be seen that when the pan is being gyrated and ore is introduced through a suitable pipe or other device 17, when the ore is deposited in the conical depressed portion of the pan and the latter is revolved, the peculiar motion of the pan will cause the several ingredients or components of the ore to become stratified in layers, which will be determined by their relative specific gravities.

In Figs. 1 and 2 I have shown a form of the pan in which the discharge of the stratified or concentrated ore components is automatically controlled and permitted by the opening and closing of a discharge pipe or passage 18 by means of a valve or plug 19 having a stem 20 guided in and detachable from a suitable bracket 21.

In starting the apparatus, after a certain volume of pulp has been fed in, the heavier components, known as the "concentrates", will collect in the lowermost central portion of the pan, and the next heavier ingredients or components of the ore will stratify above the lowermost layer and so on until the several components of the ore have arranged themselves in layers determined by their relative specific gravities, until finally the accumulated pulp begins to discharge over the open edge of the pan wall 4, when it will be collected in the annular chamber 5. After a sufficient accumulation of the ore in the chamber 5 has occurred, it will rise to the level of and flow over the uppermost edge of the wall 6 of the pan and thence into the launder 7. By securing upon the stem 20 of the discharge valve or controlling device 19 a weight or other medium 22 capable of being lifted by the pressure of the concentrates in the center of the pan, when these concentrates have reached a predetermined height, their force acting cumulatively against the body 22 will thus lift the valve or plug 19 to permit of the discharge of the heavy concentrates from the lower part of the pan 2. Inasmuch as the valuable concentrates in the lowermost portion

of the pan 2 will have a level approximate that of the device 22, against which they will press, it will be seen that there will rest or cumulate upon the uppermost portion of these heavier concentrates a layer or stratum of other components of the ore, which will have a specific gravity less than that of the concentrates, but greater than that of the tailings or gangue of the ore. By this means I obtain a preliminary concentration of the "middlings", such as gangue, including galena or pyrite, and these, after having collected upon the lower strata of concentrates, will flow into the annular chamber 5 in which they will be collected and cumulatively act to open valves 23, having stems 24, upon which are mounted suitable weights or floats 25, against which the pressure of the concentrated middlings will be effective to open the valves 23 when the middlings have reached a predetermined volume in their concentrating chamber 5. Having collected a sufficient quantity of the valuable or heaviest concentrates in the center of the pan 2, until a portion of the gangue or middlings will overflow the wall 4, and having concentrated a sufficient volume of the middlings and tailings in the chamber 5, until it eventually overflows the wall 6, that portion of the pulp containing essentially only the tailings will run continuously into the launder 7. Hence, after a predetermined quantity of heavy concentrates has accumulated in the pan 2 and has sufficient pressure to react against the device 22 to open the valve 19, thereafter during the continuous infeed of pulp, the motion of the pan 2 will constantly act to stratify or separate the concentrates and middlings or tailings, so that the first will be discharged in a certain proportionate quantity through the valve 19, the middlings will be proportionately discharged, after a predetermined quantity has collected, by the valves 23, and the tailings will eventually and continuously flow into the launder 7.

By arranging the feed apparatus 17 to discharge the pulp into the pan 2 near its center, there will be created the least disturbance by the incoming pulp to the collected and stratified material in the pan.

In order to insure the deposit of extremely fine particles of material, known as "floats" I introduce a series of annular baffles in the form of rings 26, which are suitably suspended on the pan 2; the lower edge of the rings projecting just sufficiently below the uppermost edge of the wall 6, to insure the floats descending into the fluid or liquid and thereby be sufficiently covered to be carried down by the particles in the agitated material in the pan.

In treating certain classes of ores, particularly those in which there is a considerable percentage of clay or other sticky ma-

terial, it may be expedient to introduce a certain volume of wash water, and this may be accomplished when necessary through means of a supply pipe 27 connected to the pan 2 and delivering water to an annular distributor 28, which may be appropriately connected to, or formed in, the bottom of the pan 2 at a point adjacent the discharge which is controlled by the valve 19. This additional body of clear water in the lowermost portion of the collected concentrates in the pan will facilitate the separation and wash of the latter, when they contain a dangerous percentage of sticky or clayey material.

In Figs. 3 and 4 I have shown an embodiment of my improved concentrator, in which the pan 2' is provided with a stem 9' turnably fitting in an eccentric bore in a driving pulley 12', which is mounted in an appropriate bearing or frame 13'. The operation of the pan 2' is substantially similar to that described previously referring to the pan 2, but the particular variation in the modification illustrated in Figs. 3 and 4 is in the valve mechanism, which controls the discharge of the several divided components of the pulp. In this embodiment of my invention I form adjacent the center of the pan 2' a cylindrical, upwardly projecting column 30, which may be perforated at suitable intervals at its lower portion adjacent the surface of the pan 2', as at 31, so that the concentrates collecting in the bottom of the pan will flow downwardly and rise in the column 30, eventually discharging, when reaching a predetermined height and level, into a discharge passage 32. Surrounding the discharge tube 32, there is adjustable a cylindrical sleeve or gage 33, which may be raised or lowered as desired, so that the column of concentrates collecting within the column 30 will have to rise to a level equal to the upper edge of the gage sleeve 33 before it discharges into the discharge tube 32. Surrounding the main body of the pan 2' is a second collecting chamber 5', into which the middlings from the pan 2' will fall and collect; the discharge of the middlings from the chamber 5' being controlled by a sleeve or gage 34, which is adjustable relative to a discharge tube 35. There may be as many of the discharge tubes 35 and their respective overflow gages 34 as is expedient or necessary. The tailings of the pulp will eventually rise and overflow the uppermost edge of a wall 6' and be drained away in a launder 7'.

In starting operations with the form of my invention illustrated in Figs. 3 and 4, I first adjust the discharge gage 33, so that its uppermost edge will be so elevated that a relatively large quantity of the pulp will collect and be stratified in the main portion of the pan 2' before the discharge occurs

over the edge of the wall 4' of the pan. This is for the purpose of collecting a predetermined volume of concentrates in the pan 2', after which quantity has been collected, the gage 33 may be lowered so that its upper edge will be in such position as to permit the constant draining away of a certain proportion of the incoming pulp. After the discharge of the concentrates has commenced at the gage 33, the middlings and tailings will flow continuously into the second chamber 5', and finally the tailings will discharge into the launder 7'. The motion of the pans 2—2' is substantially the same, that is, gyratory about the axis of the pulley 12 or 12', and during this constant gyration of the pan 2 the separation of the several classes of materials which compose the pulp will be automatic and constant; and the several valves or discharge controlling devices will operate to constantly permit the discharge of a portion of the concentrates or middlings as determined by the nature of the ore.

In crushing ore for concentration the operation of crushing is practically never carried far enough to perfectly liberate all particles of minerals from the gangue. These partly crushed particles of the ore, some of which consist of pure ore, some of which are composed of ore and gangue mixed and others of which are of nothing but the gangue, are severally separated so that the portion of the pulp containing pure ore or mineral is collected in the main portion of the pan, and those particles of the pulp, which contain both mineral and gangue are by the present apparatus collected for further treatment or crushing, which it has been found is the most economical method of treatment.

It is understood that I may provide in concentrators of this kind as many separating or classifying chambers or divisions as may be necessary for the treatment of various ores and minerals, and it is also understood that the several detailed elements controlling the discharge of the several segregated components of the ore may be altered or modified as conditions determine, and that I may employ driving mechanism which will operate in an equivalent manner to that described, which mechanism will have the function of imparting to the concentrating pan a gyratory or pan-like motion.

Through the use of this concentrator, losses from "greasy flotation" will be greatly reduced, if not practically eliminated. This feature plays a not unimportant part in the losses in lead concentration, and causes so great a loss in the treatment of certain copper and silver ores as to make their concentration, in many cases, commercially impossible.

This concentrator will require a reasonable amount of wash water, or no wash water at all. It will not be sensitive to variations in driving speed; this is a notable defect in present machines. It is extremely simple in construction and does not require a skilled operator. It is simple to erect. It is made entirely of metal, all of cast iron, with the exception of one bronze bushing, requiring no rubber, wood or linoleum. It will handle pulp containing 50% water, and pulp diluted to 6 parts of water to 1 of ore, a range including tube mill to stamp mill product. It will not be disarranged by rushes of pulp, or changes in dilution of the same, nor will it be affected by a complete stoppage of the feed. The power required per unit will be no greater than to operate a vanner; probably one-half horse power will be sufficient.

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

1. A concentrator consisting in the combination of a pan mounted to have a gyratory motion about a central vertical axis, means to prevent the pan having a rotary motion yet permitting said gyratory movement,

said pan having a central discharge for the concentrates and a peripheral discharge for the tailings, a central discharge automatically opened and closed by the rise and fall of the body of concentrates in the pan, and means for introducing wash water into the pan and beneath the body of concentrates adjacent to said central discharge.

2. A concentrator consisting in the combination of a pan mounted to have a gyratory motion about a central vertical axis, means to prevent the pan having a rotary motion yet permitting said gyratory movement, said pan having a central discharge for the concentrates and a peripheral discharge for the tailings, and a trough carried by and partaking of the motions of the pan into which said slimes discharge, said central discharge and said trough having means for automatically controlling the outflow of the solids.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

WILLIAM W. WHITTON.

Witnesses:

FRED J. AMIGO.
CHAS. J. SEITZ.