W. J. GRUSS & M. R. McCOLLOMS.

AMALGAMATOR.

APPLICATION FILED SEPT. 13, 1910.

1,032,332.

Patented July 9, 1912.

2 SHEETS—SHEET 1.

Fig. 1.

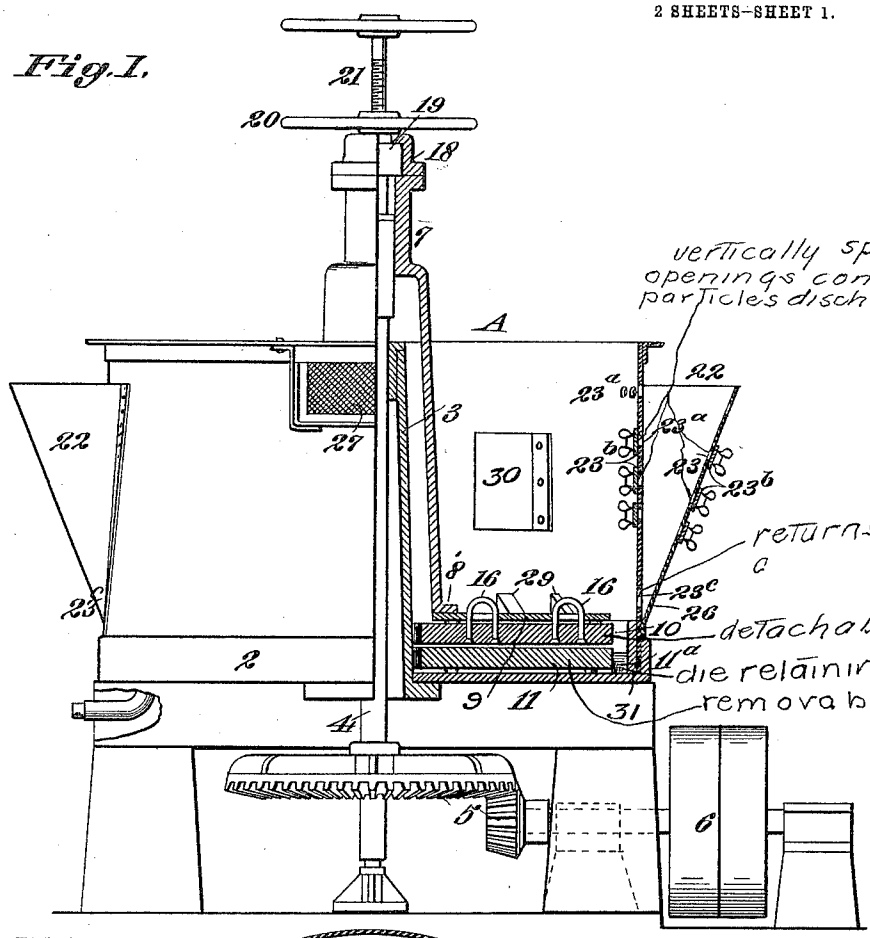
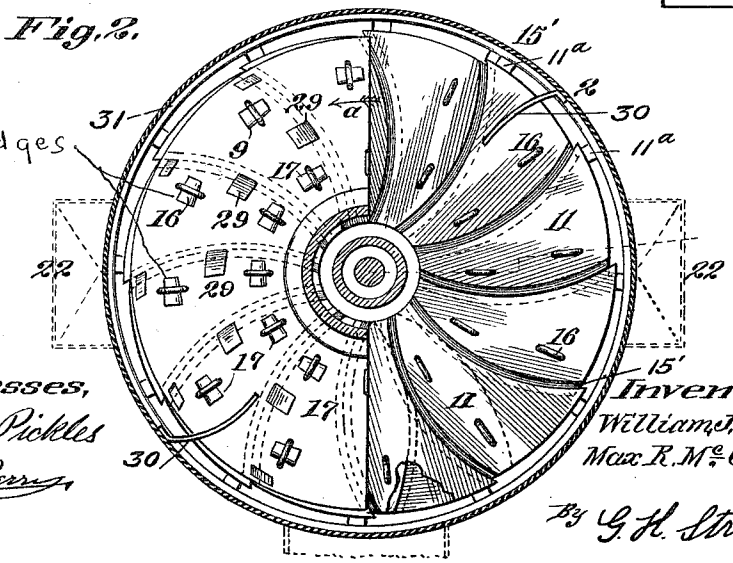


Fig. 2.



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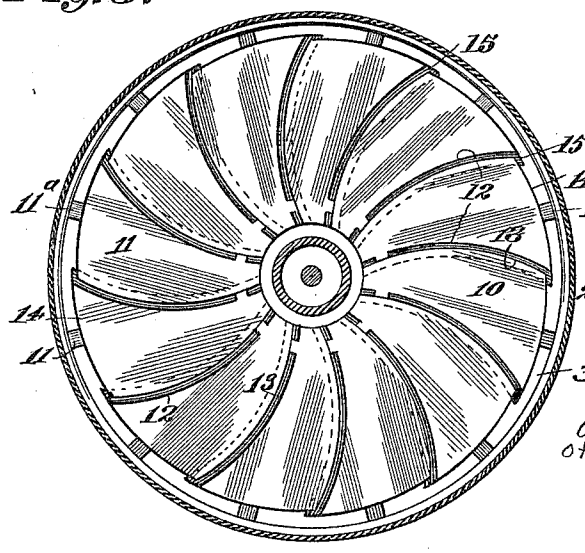
2 SHEETS-SHEET 2.

Fig. 3.



shoe sides curved oppositely to sides of die

Fig. 4.

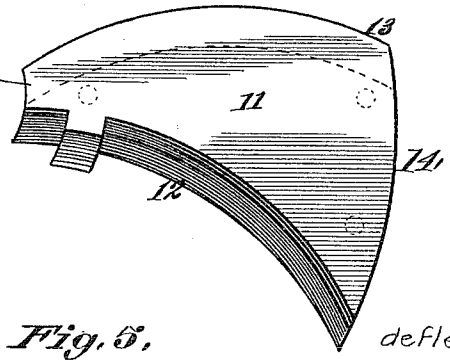


Fig. 6.

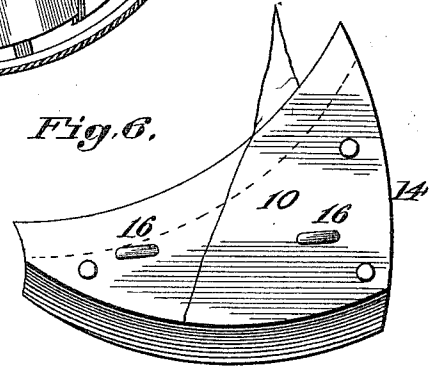


Fig. 7.

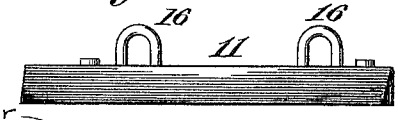
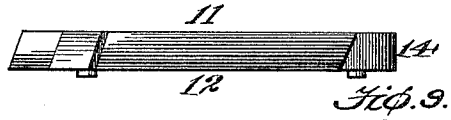


Fig. 5.



deflector

Fig. 8.

covered passage thru muller & die

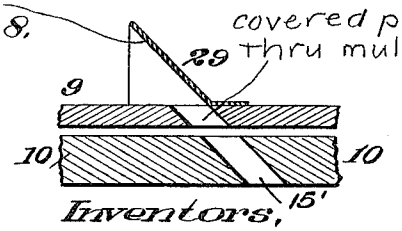
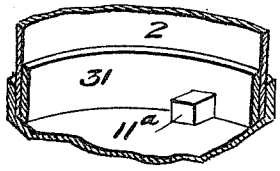


Fig. 9.



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UNITED STATES PATENT OFFICE.

WILLIAM JAMES GRUSS AND MAX R. McCOLLOMS, OF RAMSEY, NEVADA.

AMALGAMATOR.

1,032,332. Specification of Letters Patent. Patented July 9, 1912.

Application filed September 13, 1910. Serial No. 581,874.

To all whom it may concern:

Be it known that we, WILLIAM J. GRUSS and MAX R. McCOLLOMS, both citizens of the United States, residing at Ramsey, in the county of Lyon and State of Nevada, have invented new and useful Improvements in Amalgamators, of which the following is a specification.

This invention relates to grinding and amalgamating machinery.

It is the object of the invention to provide a continuous regrinding and amalgamating machine, wherein the ores are reduced to the desired size for the amalgamation of the metals, simultaneously with the production of a suitably sized tailing from the machine; all combined in one operation.

A further purpose of the invention is to so design and construct the machine as to allow for the ready adjustment of its relative parts, to provide for removal and renewal of the wearing members, and to provide an adjustable means whereby the size of the particles to be discharged from the machine may be regulated so as to afford a very large range in the degree of fineness of the material; a particular object being to so design the machine that its members may be adjusted while in operation, and to be conducive of the highest efficiency both as to volume and time required in the reduction of the ores.

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 side elevation of the machine in partial section. Fig. 2 is a plan view of the same in partial section. Fig. 3 is a plan view of the dies. Figs. 4 and 5 are detail views of a die member. Figs. 6 and 7 are detail views of one section of the shoe. Fig. 8 is a sectional detail showing the relation of the muller cap and shoe. Fig. 9 is a sectional detail in perspective showing portions of the base 2, and ring, 31, with its lug 11ª.

It is the practice in the milling of ore to first crush the rock to a certain size in crushers, and then grind it, in suitable machinery until it is reduced to particles of such size that all of its contained metals may be extracted. This fineness of the pulp varies greatly in different ores, and is different sometimes in the same ore. To this end it is proposed to provide an amalgamator of improved design, which may be quickly and easily adjusted for the grinding of coarser or finer pulp after it has been fed into the amalgamator, and by this means to enable the ore to be reduced, if desired, to what is known as slimes, so that the tailing from the amalgamator can be delivered immediately to cyanid vats for further treatment.

In the present construction of the invention, A represents a suitable pan or receiver of appropriate size and dimensions, having a rigid base 2, and provided with a central upwardly extending tubular bearing 3, through which passes a shaft 4, driven by means of appropriate gearing 5, from suitable power driven members, as pulleys 6.

Secured upon the upper end of the shaft 4 is a hub 7 forming a hood over the bearing 3, and having either integrally formed with it or removably connected to its lower flanged end 8, a disk 9, the hollow hub 7 and disk 9 forming in combination a rotary muller adapted to be vertically adjusted relatively to the bottom of the pan 2.

In order to secure the maximum capacity and efficiency in the machine, removable and renewable sectional die members 11 are suitably secured within and to the bottom of the pan, and between these die members and the lower face of the muller 9 and removably secured to the latter are a number of sections forming shoes 10, adapted to travel in close proximity to the fixed dies 11.

In obtaining the required efficiency of the machine, it has been found desirable to form the die sections and the shoe sections of a particular shape, which is productive of a constant agitation and circulation of the pulp within the pan to facilitate the mixture of the pulp particles and the bath of mercury within the amalgamator, and to prevent the creation of a constantly revolving current of fluid within the pan. In the present instance the die sections 10 are formed with one concaved edge 12 and one convexed edge 13, and preferably the exterior periphery or end of each die section is formed on a curve which is eccentric to the center of the pan A, as shown at 14. The edges 12 and 13 are both inclined relatively to the surface of the die sections 11 and when the dies have all been assembled within the pan a curved trough space 15 is produced between the adjacent sections; a cross section showing an inclined slot between the

two adjacent edges of the plates. The dies 11 are held in place by lugs 11^a in the pan which fit the eccentric peripheries of the die sections Fig. 3. The superposed shoe sections 10 attached to the muller 9 are of substantially similar shape to that of the die sections 11, but are secured to the muller 9 so that the curved edges are opposed to those of the die sections 11, (see Figs. 2 and 3), to produce the curved trough as 15'. Any suitable means may be employed for attaching the shoe sections 10 to the muller, and we have here shown one form comprising U-shaped eyes 16 or bolts fastened to the upper surface of the shoes 10 and projecting upwardly through slots in the muller 9, and being retained therein by semi-cylindrical wedges 17, forced beneath the eyes 16 and on top of the muller. It will thus be seen that when the muller is rapidly revolved, as indicated by the arrow *a*, the concaved inclined edges of the shoe sections 10 act scoop fashion upon the pulp and draws it inwardly, in between the grinding surfaces between the adjacent opposed faces of the shoes 10 and dies 11, and the direction of current will be opposed by the reverse inclination of the slots or troughs 15 in the die sections. This causes a violent precipitation of the heavy ore bearing particles so that they are acted upon quickly by the mercury within the pan, and also as the surfaces of the shoes 10 of the dies 11 are working in close proximity, the coarse particles of the ore will be quickly ground before they can discharge from the machine.

In order to allow for a quick and positive adjustment of the muller shoe sections toward or from the dies 11, we have fastened on the upper end of the hub 7 a flanged collar 18 adapted to engage a nut 19 which turns on a screw 21 and supports the weight of the muller. Nut 19 is fastened to a hand wheel 20, whereby it may be turned about the screw 21. Thus by moving the nut 19 relatively along the screw 21, the sleeve 18 and hub 7 and muller will be raised or lowered as regards the pan, and this will open or close the space between the shoes and the dies, whereby any degree of fineness may be obtained before the object is discharged from the machine. This arrangement allows the muller to rotate at full speed, while the screw and hand wheels may be held stationary and the muller with its shoes thereby lowered or raised at will.

For the purpose of controlling the discharge of the pulp after it has been ground within the pan, there is provided one or more discharge wedge-shaped pockets 22, secured on the outer periphery of the pan A with the apexes of the pockets proximate to the level of the muller and dies. Each pocket is provided with series of horizontal slots 23 formed at different elevations in the inclined back wall of the pockets 22. The wall of the pan has a plurality of rows of perforations 23^a on a level with the holes 23. The several rows of openings 23—23^a may be covered with loose plates or dampers 23^b, held on by thumb screws, where it is desired to control the character of the discharged slimes. Thus, covering all but the lowermost of the holes 23—23^a, will allow only the coarsest material in suspension to discharge. If it is desired to reduce the pulp to slimes only the topmost rows of holes 23—23^a are left uncovered, all the remaining lower rows of holes being closed, and the pulp will gradually rise until it reaches the level of the open row of holes through which it will discharge and fill the pockets. Obviously, the slot openings 23 in the pockets will be covered so that the only discharge slot which will be open will be the one opposite that row of discharge holes in the pan which is open. The peculiar result of this construction of discharge pocket outside the wall of the pan is that when slimes are being ground any coarse particles which happen to discharge through the uppermost holes 23^a will be allowed to settle in the comparatively quiet material in the discharge pocket, and only slimes will pass through the openings 23, there to be caught in a suitable launder 23^c.

The size and shape of the pockets are such as to give time for heavy particles of ore to fall within the discharge chamber and return into the pan through a perforation 26 near the bottom of each pocket, so that the coarse particles will be unable to discharge from the pockets. The top rows of holes 23—23^a are meant for absolute sliming, the coarse particles, in case any are at that level, dropping in the quiet water in the pockets before discharging, and returning through the two inch hole 26 and at the bottom of the pockets. The other sets of holes may be used for coarser discharge in case it is not necessary or desired to slime the material, as there is a larger percentage of coarse material the lower in the pan you go, and also there is less space allowed in the discharge itself for the settling of these particles before being discharged. There is one screen frame 27 on each side of the regular discharge arrangement. These can be used with any mesh desired or closed entirely with blanks. This makes a very elastic discharge; most anything desired, from slimes on up. If desired, the muller plate 9 may be perforated at numerous points, as 28, and small caps or deflectors 29 are fastened above the perforations to further cause agitation within the pan and direct pulp downwardly through the muller toward the shoe sections 10 and upon the die sections 11.

The shoes and dies are arranged so as to give practically the entire area of the pan

into a grinding surface, insuring at the same time an even wear. The arrangement of the muller is such that it can wear to thinness without interfering with the action of the machine. As the shoes slide over the dies their shape is such as to cause a suction, dragging the material from all directions between the grinding surfaces. The curve and bevel of the edges and the projections of the outer point all tend to give the desired result, dragging the material in from the outer parts of the pan. The muller is arranged to slide up and down, and it may be easily raised while in motion, thus avoiding the difficulty of having material settle over the muller and making it hard to start after stopping. The series of caps 29 on the muller plate 9 with corresponding holes through the muller into the space between the shoes to the grinding surface, forces the material to the proper place and gives an added guarantee of ready access of material to the grinding surface. These caps are open on the front side and on the side nearest the center of the machine, thus acting as a sort of scoop. Curved wings 30 on the inside stop the tendency toward a circular flow of current. A ring 31 takes the wear from the pan at the bottom.

Having thus described our invention, what we claim and desire to secure by Letters Patent is:—

1. The combination in a continuous regrinding and amalgamating machine of a pan having a bottom grinding surface, including shoes spaced from each other to form outwardly curving grooves, a rotating muller revolving over said surface and having outwardly curved grooves on its surface adjacent to the said grinding surface, the grooves in the muller being curved in the opposite direction to the grooves in the grinding surface, and the outer edge of the shoes being curved and eccentric to the inner circumference of the pan to form on each shoe a leading point following the rear point of a preceding shoe thereby producing a plow effect on the pulp or sands in the bottom of the pan.

2. A grinding pan having a grinding surface in its bottom, a complementary rotary grinding member in the pan coöperating with said bottom grinding surface, said grinding members having their adjacent faces provided with curved grooves or troughs extending outwardly from the center of rotation of said rotary member, and said grinding members having outer edges arranged eccentric to the inner circumference of the pan to form on each shoe a leading point following the rear point of the preceding shoe thereby producing a plow effect on the pulp or sands in the bottom of the pan.

3. A grinding and amalgamating machine comprising a pan with stationary dies arranged radially about the center of the pan, said dies consisting of sectors with curved sides converging toward the center of the pan, the several sectors spaced from each other to provide curved radially extending troughs or slots between the sectors, said sectors having outer edges eccentric to the inner circumference of the pan to form on the sector a leading point following the rear point of a preceding sector, thereby producing a plow effect on the pulp or sands in the bottom of the pan, and a rotary muller above and coöperating with said dies.

4. A grinding and amalgamating machine comprising a pan with stationary dies arranged radially about the center of the pan, said dies consisting of sectors with curved sides converging toward the center of the pan, the several sectors spaced from each other to provide curved radially extending troughs or slots between the sectors, said sectors having outer edges eccentric to the inner circumference of the pan to form on the sector a leading point following the rear point of a preceding sector, thereby producing a plow effect on the pulp or sands in the bottom of the pan, a rotary muller above and coöperating with said dies, and said muller having shoes of similar form to the dies and similarly spaced from one another to provide intervening trough spaces on the under-side of the muller, said trough spaces curved radially in a reverse direction to the trough spaces between the dies.

5. A grinding and amalgamating machine comprising a pan with stationary dies arranged radially about the center of the pan, said dies consisting of sectors with curved sides converging toward the center of the pan, the several sectors spaced from each other to provide curved radially extending troughs or slots between the sectors, a rotary muller above and coöperating with said dies, said die sectors having their peripheries eccentric to one another whereby one side of each sector is shorter than the other side, and stops in the pan engaging said eccentric peripheries to hold the dies in place.

In testimony whereof we have hereunto set our hands in the presence of two subscribing witnesses.

WILLIAM JAMES GRUSS.
MAX R. McCOLLOMS.

Witnesses:
WILLIAM M. FULLER,
H. S. POHE.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."