(No Model.)

W. ROBERTS.

GRINDING AND AMALGAMATING PAN.

No. 448,731. Patented Mar. 24, 1891.

Fig. 1.

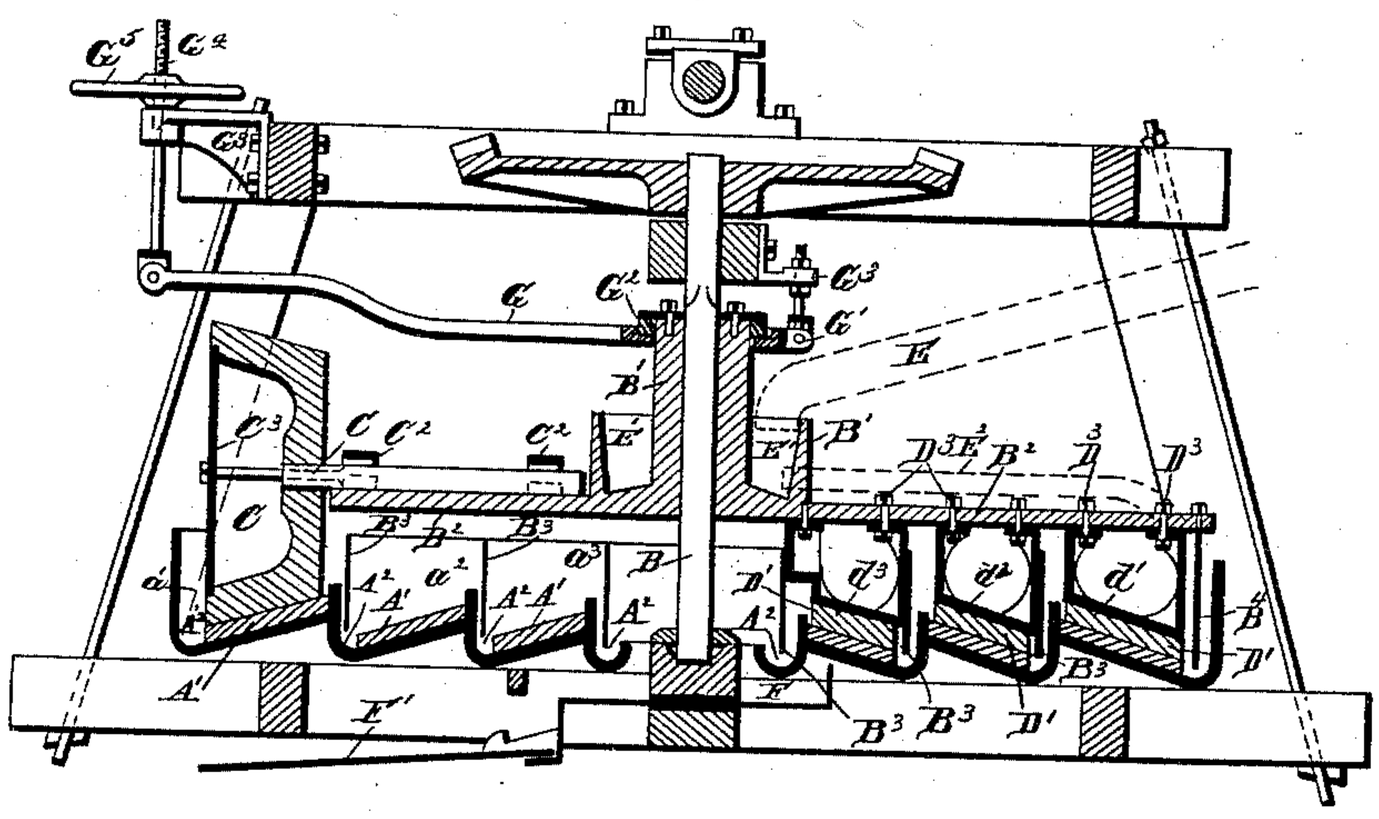
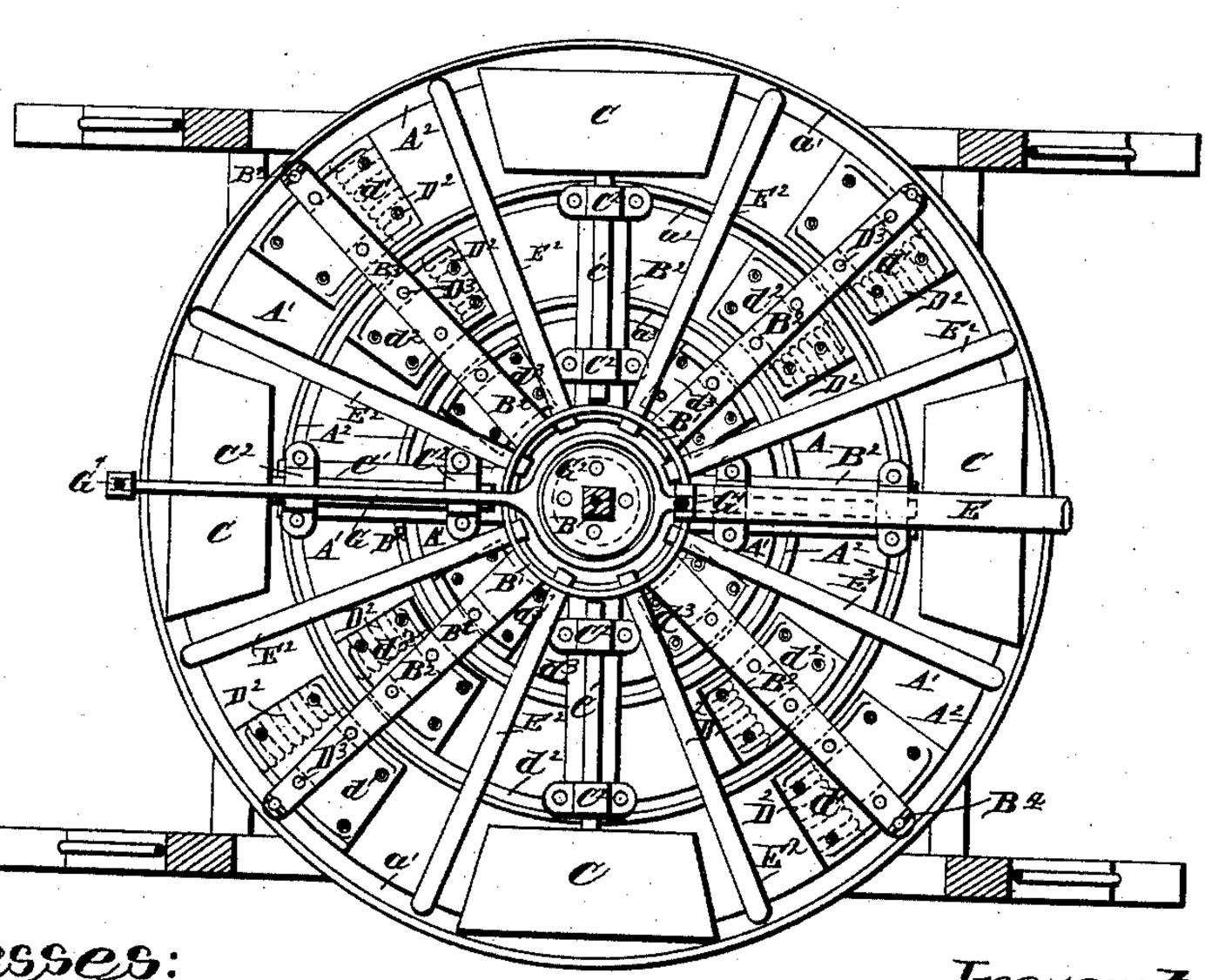


Fig. 2.



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WILLIAM ROBERTS, OF PETERSHAM, NEAR SYDNEY, NEW SOUTH WALES, ASSIGNOR TO HIMSELF AND HOWARD RAYMOND BELDEN, OF SAME PLACE.

GRINDING AND AMALGAMATING PAN.

SPECIFICATION forming part of Letters Patent No. 448,731, dated March 24, 1891.

Application filed January 10, 1890. Serial No. 336,520. (No model.) Patented in Victoria November 29, 1889, No. 7,310, and in Queensland February 27, 1890, No. 884.

To all whom it may concern:

Be it known that I, WILLIAM ROBERTS, mechanical engineer, a subject of the Queen of Great Britain, residing at Petersham, near Sydney, in the colony of New South Wales, have invented certain new and useful Improvements in Grinding and Amalgamating Pans, (for which I have obtained Letters Patent in the British colonies of Victoria and Queensland, dated, respectively, November 29, 1889, No. 7,310, and February 27, 1890, No. 884,) of which the following is a specification.

This invention relates to improvements in grinding and amalgamating pans; and it has been specially devised in order to produce machines of such description as will thoroughly and quickly crush, grind, or disintegrate metalliferous and other materials, and, if desired, effectively amalgamate precious metals contained therein.

The invention consists in structural features and combinations of parts or co-operative elements, as will now be fully described, reference being had to the accompanying drawings, in which—

Figure 1 is a sectional elevation, and Fig. 2 a top plan, of a grinding and amalgamating apparatus embodying my invention.

The apparatus is supported by a suitable frame-work, in which are formed the bearings for the revoluble elements, B indicating the shaft that carries at its upper end a bevel-wheel as a means for imparting motion to said shaft, which also carries a sleeve B′, that is connected with the shaft by a spline or feather, so as to partake of the rotation thereof and yet have free vertical motion. The sleeve is provided with a collar G^2, that serves as a bearing for the annular end of lifting-lever G, that is fulcrumed at G′ in the fork of a bolt connected with a bracket G^3, secured to the upper bearing for the shaft B. The opposite end of the lever G is pivotally connected with an elevating-screw G^4, that works in a threaded bearing G^6, secured to the supporting frame-work.

Around the sleeve B′ is formed a feed vessel or receptacle E′, into which extends the discharge end of the feed or supply pipe E, through which the material operated is fed to receptacle E′ from any suitable reservoir or holder. (Not shown.)

From the feed-vessel E′ radiate a number of arms B^2, as well as a number of distributing-pipes E^2, that are in communication with feed-vessel E′ and extend outwardly, so as to discharge the material at a point close to the outer wall of the outer pan.

Some of the radial arms B^2 are provided with bearings for a spindle C′, on the outer end of which is mounted a muller C, that has the form of a truncated cone and is preferably hollow and open at the end of greatest diameter, said open end being closed by a back plate C^3 to prevent the material or the mercury from entering the muller. In Fig. 2 I have shown four mullers, all operating in the outer section a' of the amalgamating-pan, which is composed of a plurality of pan-sections and a central or axial cylindrical section a^4, open at top and bottom, there being shown three concentric pan-sections a' a^2 a^3, each constituting a grinding and amalgamating pan. As shown in Fig. 1, the concentric sections are separated by a comparatively low partition relatively to the inclosing wall of the outer section a', so as to admit of the overflow of the material from one pan-section to the other. The bottom of these pan-sections is inclined outwardly or radially and its lower edge is curved, and each of said sections is provided with a removable false bottom or wearing-surface A′, that is of less width than the bottom of the pan-sections and of such thickness as to nearly fill the space between the bottom of the pan-section and the upper edge of the partition-wall. By this construction and arrangement I not only obtain a comparatively shallow inwardly-rising grinding-surface, but also a comparatively deep annular well A^2 at the foot of the incline and encompassing the same for the reception of the mercury when the apparatus is used for grinding ores and simultaneously amalgamating the precious metals. On the other hand, the advantages of removable wearing-surfaces will be readily understood by those

conversant with apparatus of the class under consideration. To the arms B^2 are also secured drags d' d^2 d^3, of which I have shown four for each pan-section. About one-third (more or less) of the under or grinding face of these drags is fluted or corrugated from that end which lies in the direction of rotation of the drags toward its center, as shown at D^2 in dotted lines in Fig. 2.

The object of fluting or corrugating that portion of the under side of the drags that lies in the direction of motion is to prevent the drags from acting as scrapers and push the material over them as they revolve. By fluting the drags, as described, channels are formed that will allow the material to pass under them and be acted upon by the non-corrugated or actual grinding-surface. On the other hand, this construction also avoids splashing and the pushing of the material before it is properly acted upon over the shallow partition-wall between two concentric pan-sections. These drags are adjustably connected with the arms B^2 by means of bolts D^3, and to the support of each drag is secured a teaser or stirrer B^3, and a splash-board B^4 is secured to the outer ends of the arms B^2 that do not carry a muller, said splash-boards performing also the function of teasers and preventing the splashing of the material as the mullers travel over the same. It has hereinbefore been stated that the sleeve B′ is free to slide vertically on shaft B. This is necessary in order to allow the mullers to travel over the uneven surface formed by the comminuted ores, the drags partaking of this movement; hence the use of the splash-boards.

Below the central open-ended pan-section is arranged the receiver F, that discharges into the delivery-chute or lander F′.

In operation the tailings or other metalliferous material or sand, &c., are supplied with water from a convenient receiver or feed-box, and the shaft B is set in motion, say, by bevel-gearing, as shown, and when amalgamation is carried on mercury is supplied in pans and wells A^2. The material is fed to hopper E′, and is distributed therefrom by the pipes E^2 to the outer part or mercury-well of the outer pan a', thence passing onto the upwardly-inclined grinding-surface thereof, where it is ground or reduced by the mullers and drags and overflows into mercury-well of pan a^2, and so on until the material reduced to an almost impalpable powder reaches the inner circular amalgamating-well, and from thence passes to the receiver F and to lander F′, from which it flows to waste or is collected for further treatment. The material in the mercury-wells of the several pans is continuously stirred up by the splash-boards B^4 and teasers B^3, respectively, so that the separation of the particles of precious metal from the ore and its amalgamation with the mercury is rendered more complete. In all the wells A^2 teasers similar to B^4 are preferably placed outside the splash-board B^3. The disk B′, being vertically loose on shaft B, is free to slide up and down as the mullers C roll over the material on the bottom of pan a', and the weight and wear of said mullers regulate the degree of intimacy of drags d', d^2, and d^3 with bottom of the pans, and this intimacy is further adjusted by the bolts D^3, so that the grinding-surfaces A′ and D′ just touch, but have no grip one on the other. As the drags d', d^2, and d^3 travel around, the flutes or corrugations therein allow the pulp to pass freely under instead of being pushed in front. In order that the operations may be easily started after stoppage with pulp in the pans, the hand-wheel G^5 is revolved, and by means of lever G under collar-bracket G^2 lifts the whole of the gear on disk B′ clear of the obstructing pulp in the pans.

Although I have described the mullers as operating within the outer annular pan-section a', it will be understood that one or two pairs of mullers may be provided for one or both of the other annular pan-sections, and that a greater or less number of such sections than that described and shown may be provided. It will also be understood that it is not material to the working of this invention whether the pans proper or the grinders proper have motion imparted to them so long as there is relative motion—that is, that either the disk B′ and its attachments are still and the pans a', a^2, and a^3 revolve, or, as is preferred and as shown, the former are revolved and the latter are stationary. Of course, when the pan is caused to revolve the fluting of the then stationary drags will be at that end toward which the pan moves.

Having now particularly described and explained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. An ore grinding and amalgamating machine comprising a plurality of concentric pan-sections having comparatively shallow partition-walls, the height of which decreases successively from the outer to the inner pan-section, grinding-surfaces for said pan-sections that incline outwardly in a radial direction, and an amalgamating-well at the foot of and encompassing the grinding-surfaces, said wells lying in the same horizontal plane, in combination with grinding devices operating in conjunction with said inclined grinding-surfaces, substantially as and for the purposes set forth.

2. An ore grinding and amalgamating machine comprising a plurality of concentric pan-sections having comparatively shallow partition-walls, the height of which decreases from the outer to the inner pan-section, grinding-surfaces for said pan-sections that incline outwardly in a radial direction, and an amalgamating-well at the foot of and encompassing the inclined grinding-surfaces, said wells lying in the same horizontal plane, in combination with mullers having the form of a trun-

cated cone, and drags arranged to co-operate with the inclined grinding-surfaces to reduce the material fed thereto, substantially as and for the purposes set forth.

3. In an ore grinding and amalgamating pan, a plurality of concentric pan-sections, an annular amalgamating-well for each of said sections, and grinders operating in the pan-sections, in combination with revoluble circular splash-boards dipping into the mercury-well of the outer pan-section, for the purposes set forth.

4. In an ore grinding and amalgamating pan, a plurality of concentric pan-sections, an annular amalgamating-well for each of said sections, grinders operating in the pan-sections, and circular splash-boards B^4, in combination with teasers or traveling stirrers, substantially as and for the purpose set forth.

5. The combination, with the shaft B and the sleeve B′ thereon carrying the muller and drag-arms, of the lever G, connected with said sleeve so as to admit of its revolution with the shaft, and the elevating-screw G^5, substantially as and for the purpose set forth.

6. In an ore grinding and amalgamating apparatus, a series of concentric intercommunicating pan-sections, an amalgamating-well for each of said sections, a feeding device for feeding the material to the outer pan-sections, and a central discharge, as and for the purpose set forth.

7. In an ore grinding and amalgamating apparatus, a series of concentric intercommunicating pan-sections, an amalgamating-well for each of said sections, a feeding device for feeding the material to the outer pan-sections, a central discharge, and a mercury-well arranged in said central discharge, as and for the purposes set forth.

8. The combination, with the grinding and amalgamating pan, constructed as set forth, of the shaft B, the sleeve B′, adjustable on and adapted to revolve with the shaft, the reservoir E′, the distributing-pipes E^2, connected with said reservoir and discharging into the outer annular pan-section, and the grinders supported from said sleeve, substantially as and for the purposes set forth.

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

WILLIAM ROBERTS.

Witnesses:
FRED WALSH,
THOMAS J. WARD.