J. H. BUXTON.

GOLD ORE GRINDING MILL.

APPLICATION FILED APR. 1, 1912.

1,040,876.

Patented Oct. 8, 1912.

2 SHEETS—SHEET 1.

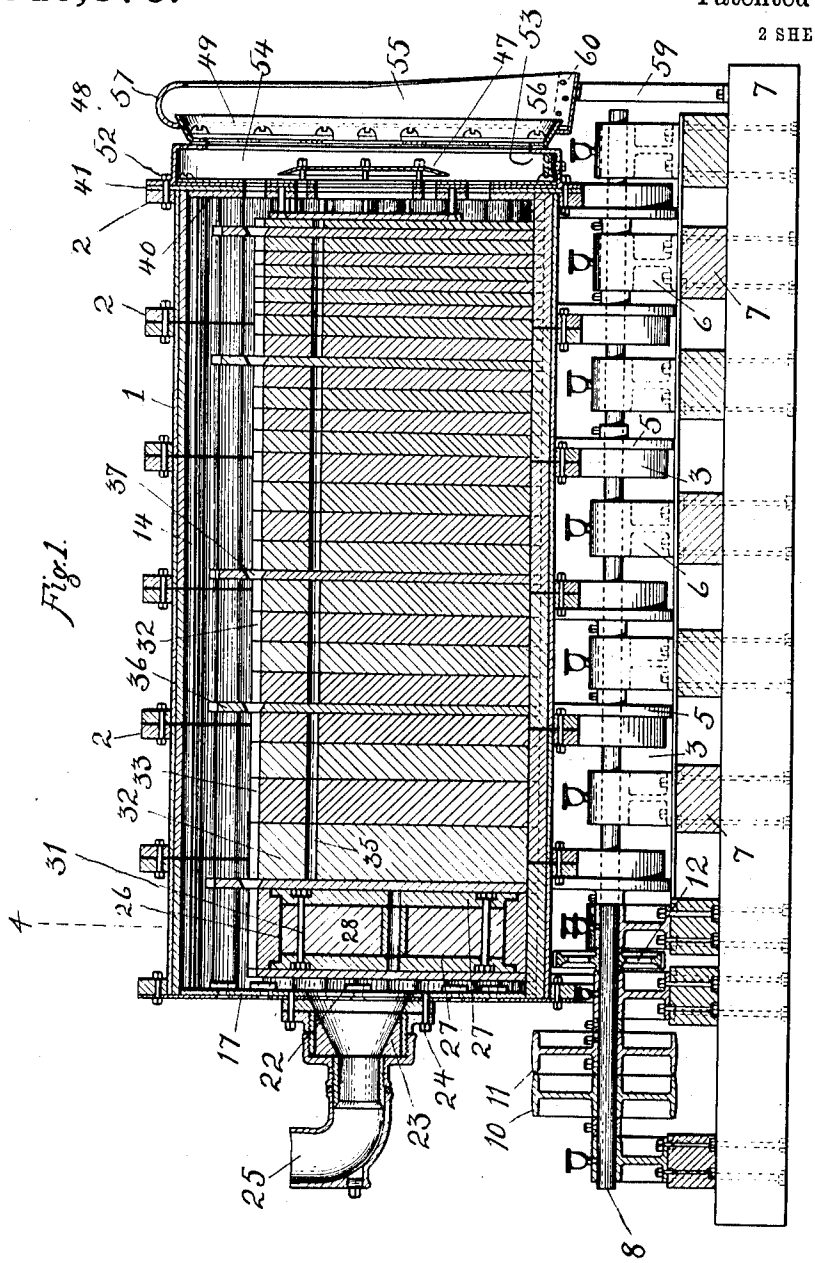

Fig. 1.

WITNESSES:

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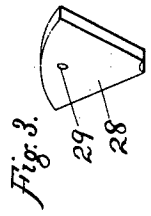

Fig. 3.

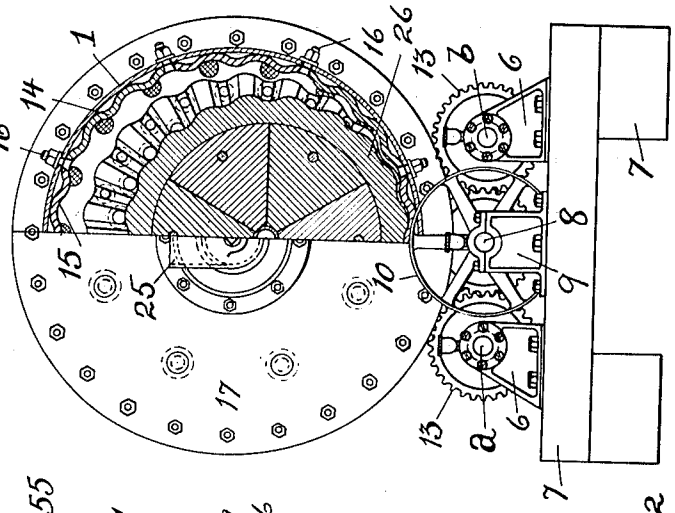

Fig. 4.

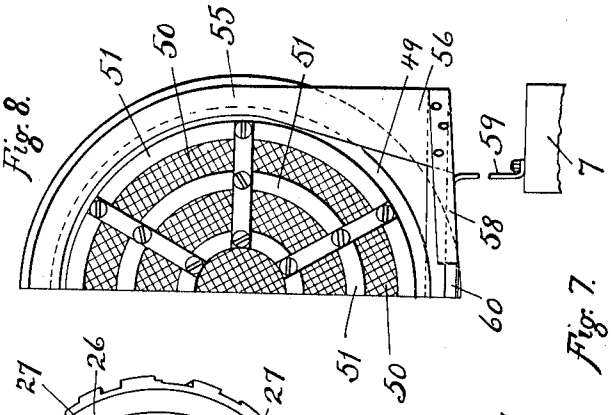

Fig. 8.

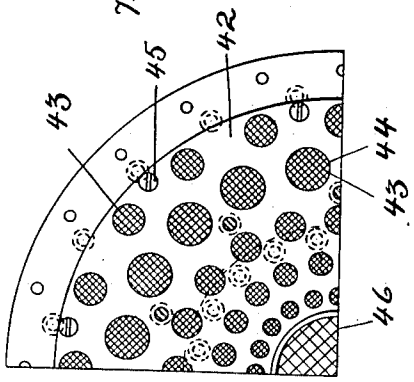

Fig. 7.

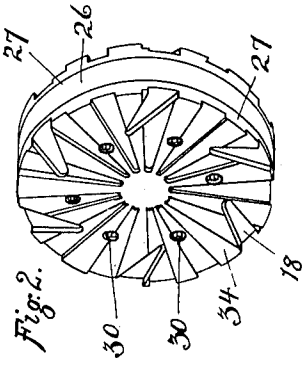

Fig. 2.

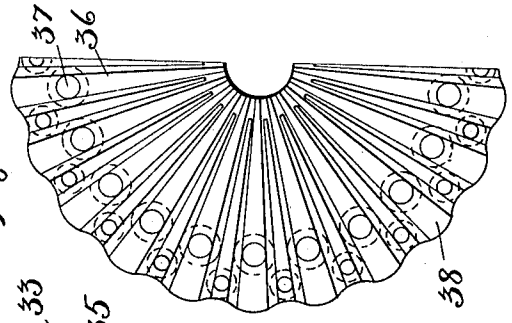

Fig. 6.

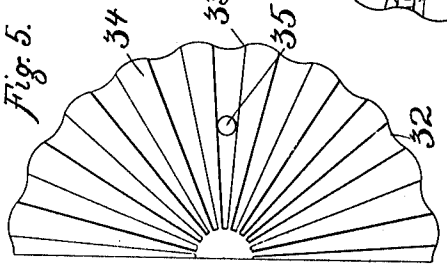

Fig. 5.

WITNESSES

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UNITED STATES PATENT OFFICE.

JOHN H. BUXTON, OF BALTIMORE, MARYLAND.

GOLD-ORE-GRINDING MILL.

1,040,876. Specification of Letters Patent. Patented Oct. 8, 1912.

Application filed April 1, 1912. Serial No. 687,578.

To all whom it may concern:

Be it known that I, JOHN H. BUXTON, a citizen of the United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Gold-Ore-Grinding Mills, of which the following is a specification.

This invention relates to an improved gold ore grinding and amalgamating mill of the type that comprises loose weights inclosed in a revolving cylinder.

The several objects of the invention will appear in the appended description.

The invention is illustrated in the accompanying drawing, in which,

Figure 1 is a vertical longitudinal section of the ore-grinding and pulverizing mill. Fig. 2 is a perspective view of a pulverizing roller showing one form of construction when made up of sectional parts. Fig. 3 is a perspective view of a segment lead plate. Fig. 4 shows the front or inlet end of the revoluble cylinder—one half being a vertical section on the broken line 4, of Fig. 1 and the other half an exterior view. Fig. 5 is a side view (one half) of a loose grinding roller. Fig. 6 is a side view (one half) of one of the baffle plates. Fig. 7 is a rear end elevation (one fourth) of the revoluble cylinder. Fig. 8 is a rear or outlet end elevation showing the stationary screen in which the end of the cylinder revolves.

The shell of the revoluble cylinder is designated by the numeral, 1; the exterior of the cylinder is provided with hoops or bands, 2, and the cylinder is supported on rollers, 3, each of which has a circumferential flange, 5. The rollers are arranged in two sets; all those in one set being mounted on a shaft, *a*, and those of the other set mounted on a shaft, *b*, said two shafts are parallel. Suitable bearings, 6, support the shafts and rest on foundation, 7; the rollers are arranged in pairs—one roller of each pair on one shaft and the other roller on the other shaft thus the two sets of rollers are at opposite sides of a central vertical line through the cylinder. Each hoop, 2, on the cylinder sets on the circumferential rims, 4, of the two rollers comprising a pair, and the flanges, 5, of said rollers prevent endwise movement of the cylinder, 1. Adjacent the inlet end of the cylinder is a drive-shaft, 8, mounted in bearings, 9, between the said two roller shafts, *a*, *b*. The drive-shaft carries a loose-pulley, 10, a fixed pulley, 11, for a driving belt, not shown, and a gear wheel, 12, that engages with gear wheel, 13, on the two shafts, *a*, *b*. The revolution of the drive shaft, 8, will cause its gear, 12, to impart rotary motion to all of the rollers, 3, and the rollers will turn the cylinder, 1. The cylinder, 1, may be operated either in a horizontal position or in a slightly inclined position—in which the outlet end would be lower than the inlet end. The cylinder has lining plates, 14, of hardened metal; the inner or concave surface of these plates has corrugations, 15, and bolts, 16, hold the plates fast to the cylinder. The inner end of the cylinder is closed by a head, 17, having a central opening, 22, around which is affixed an exterior inlet-nozzle, 23; this nozzle is fastened by screws, 24. A supply hopper or funnel, not shown, may connect with an elbow inlet-pipe, 25, attached to the said inlet-nozzle, 23. The elbow part of the inlet pipe may have a lateral opening that is normally closed by a screw-cap or plug, as seen in Fig. 1. This lateral opening may be used, if desired, as the inlet for a horizontal water-feed. Of course water may also be entered from the said hopper or funnel.

The ore that is to enter the cylinder must have been crushed and passed through a screen of suitable mesh in order to remove particles that are too large for the "feed" of this mill; this crushed ore mixed with water constitutes the "feed" that passes through the inlet nozzle, 23, to the cylinder, 1.

The interior space of the cylinder contains a number of grinding or pulverizing rollers of variable thickness which are loose and free to revolve, said rollers being placed side by side in varying numbers to form a group, and the groups being separated by circular revoluble baffle-plates, 36. It will be understood of course, that the rotary movement of the cylinder, 1, causes the pulverizing rollers, and the circular baffles, to roll freely within the said cylinder. I prefer that some of the pulverizing rollers be constructed of a steel case filled with lead plates, and as lead is heavier than iron or steel thus obtain the advantage of a greater weight in a given size roller. Two forms of construction for such a roller are shown; a diametrical sectional view of one form is seen in Fig. 1,—being the large roller nearest to the inlet nozzle, 23, of the cylinder. In this form the steel tire, 26, incloses V-shaped

segment plates, 28, made of lead, and also surrounds the two side disk plates, 27, of hard steel. Another form of construction for such a roller is shown in Fig. 2, in which a hard steel tire that incloses the lead V-shaped segment plates is clamped between the two side disk plates, 27, made of steel. In both of these forms of construction the V-shaped segment plates completely fill the steel tire, and the disk plates form the sides of the roller and cover the sides of the lead plates, 28, and fit tightly in contact with the steel rims, 26; thus the heavy lead plates are completely inclosed by the steel plates. Each segment plate of lead has a hole, 29, and the outer disks are provided with holes, 30, so spaced apart that each hole in the side disk will register with a hole in one of the lead plates, and bolts, 31, extend through the disk-plate, 27, at one side, through the segment-plates, and also through the disk plate at the other side, and these bolts clamp the two disk plates, 27, tightly to their position. This construction makes an extra heavy roller relative to its size and a durable one. A thin plate, 39, is interposed between the inlet nozzle and the side disk, 27, of the heavy roller. In the present instance the larger part of the numerous pulverizing rollers are solid metal disks, and of course have no lead filling; all those designated, 32, are solid.

The several pulverizing rollers instead of being of the same thickness and weight are preferably made to vary in thickness and weight, and are relatively placed in the cylinder so that the thickest and heaviest rollers are nearest the inlet-end, and the thickness and weight of the said rollers gradually diminish from said inlet-end of the cylinder toward the outlet end thereof where the rollers are thinnest. In order to increase the grinding effect between the circumferential rims of the rollers and the concave lining of the cylinder, some or all of the rollers have on their circumferential rim corrugations, 33, which engage or co-act with the said corrugations 15, on the concave lining of the cylinder. Some of the rollers may have smooth rims.

To produce a positive grinding action between the contacting surfaces of two adjoining rollers, 32, I have provided that some or all of the crushing rollers shall have radial ridges, 34, see Fig. 5. The crushing rollers may have these radial ridges on one side only, or on both sides. Each roller also has a hole, 35, whose purpose is to receive the end of a rod or tool in the hands of a mechanic merely to facilitate handling the roller when placing the rollers in, or taking them out of the cylinder.

The groups of grinding rollers are separated by circular baffle plates, 36, which must have a greater diameter than the rollers and a less diameter than the interior of the cylinder and also free to revolve therein in order to serve the function of baffling, which is to prevent the ground ore from too rapidly moving toward the exit end of the cylinder. These baffle plates may have their surfaces that adjoin the rollers smooth or rough, and if roughness is desired they may have radial ridges, 38, similar to those on the grinding rollers. Also the rim edges of the baffle plates may be provided with cross corrugations similar to those (33) on the rollers. The baffle plates also have tapered holes, 37. This taper may be produced by reaming out or enlarging the hole at one side of the plate, as seen in the section view of said plate. In placing the baffle plates, 36, in the cylinder they should be positioned with the reamed-out or enlarged sides of their holes, 37, toward the discharge end of the cylinder. The ground ore always moves in the direction of the discharge end, and when the plates are thus placed any ground ore that enters one of these holes must enter at the small end of the hole, and consequently the ground ore will not pack in the said hole and will not form therein hard plugs of ore.

The discharge end of the cylinder is closed by two circular plates, 40, 41; the plate, 40, fits within the end of the cylinder and the other plate, 41, laps on to end of the cylinder and in contact with the end-loop, 2. A third circular plate, 42, is outermost. Between the plate, 41, and the outermost plate, 42, is a circular wire screen, 43. The three circular plates, 40, 41, and 42, have circular holes, 44, of the same number and size, which are coincident in their position in each of the said three plates, and the wire screen, 43, is seen at the open holes. The outermost plate, 42, which covers the screen, 43, is held to its position by screws, 45. At the center of the several circular plates is a center hole, 46, through all of the plates, but not through the screen, and on outer side of the outermost plate, 42, is a shield plate, 47, that stands off a little from the plate and serves as a guard over the said center hole, 46.

Two outer rings or collars, 48, 49, have a circular screen, 50, secured between them; on the exterior of the said screen are bars, 51, see Figs. 1 and 8, that serve to protect the screen and also to hold the screen from sagging. The collar, 48, is attached to the end of the cylinder by means of screws, 52, and an inturned flange, 53, on this collar forms an annular pocket, 54, in which the amalgamated metal (gold and quicksilver) may accumulate. The two collars, 48, 49, and the screen, 50, revolve with the cylinder.

A stationary hood, 55, has a shape approximating that of a horse-shoe, and this hood stands vertically on its two heel-ends,

56. This hood is made of sheet-metal and in cross-section the top part of the hood has a curved shape like one-half of a tube or pipe, as at, 57, in Fig. 1. The end elevation of this hood is seen in Fig. 8. The two heels, 56, of the hood rest on a pan, 58, and the pan and hood are supported on standards, 59, which rest on the foundation, 7. The curved cross-section shape, 57, hooks over the flared rim of the collar, 49.

The water that flows from the machine escapes at the open lip, 60.

The operation of the machine is as follows:—The cylinder, 1, is set in motion, a proper quantity of quicksilver having first been introduced at the inlet end of the cylinder. The ore that has been prepared to "feed" the mill is to be mixed with water and introduced into the inlet pipe, 25, and thence passes through the inlet nozzle, 23, and through the central opening, 22, into the end of the cylinder. The first roller in the cylinder that will act on the ore is the largest and heaviest—the one that has the lead filling and the steel rim or tire, 26. This pulverizing roller will turn as the cylinder revolves, the tangential grooves, 18, on the sides of this roller, will act on the crushed ore and agitate it and keep it moving, and the ore will also be ground between the rim, 26, and the corrugated lining, 15. As the baffle plates, 36, have a larger diameter than the adjoining grinding rollers there will be a difference in the speed of revolution of the rollers as compared with the speed of the baffle plates, which varying speed produces a grinding action on the ore between said two revolving surfaces. While the cylinder, 1, revolves the ground ore will gradually pass from the first space where the heaviest roller is, past the first baffle plate, 36, to the second space where there happens to be four rollers, 36, and there the ore will undergo a further pulverization. The powdered ore will be kept in motion and the grinding action will also go on between the radially corrugated contacting surfaces of the rollers, 36. The grinding operation will continue, and any particles of gold will be blended with the quicksilver and the amalgam will be washed by the water, and while the water will finally escape at the lip, 60, the amalgamated metals will find lodgment in the pocket, 54, from which it can be easily removed.

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

1. A gold and silver ore mill having in combination a revoluble cylinder; a number of circular grinding rollers loose in said cylinder and free to revolve therein and filling the cylinder from end to end; and circular baffle plates having a greater diameter than said rollers and a less diameter than the interior of the cylinder and also free to revolve therein and spaced at intervals between said rollers, whereby said rollers form groups each group comprising a plural number of rollers.

2. A gold and silver ore mill having in combination a revoluble cylinder whose inner cylindric surface has corrugations extending lengthwise; a number of flat circular grinding plates loose in said cylinder and free to revolve on their edges and filling the cylinder from end to end; and some or all of said rollers having corrugations crosswise of their circumferential rims.

3. A gold or silver ore mill having in combination a revoluble cylinder; a number of circular grinding rollers loose in said cylinder and free to revolve therein and filling the cylinder from end to end and said rollers having their sides provided with radial ridges; and circular baffle plates having a greater diameter than said rollers and spaced at intervals between said rollers, whereby said rollers form groups each group comprising a plural number of rollers.

4. A grinding roller for revoluble cylinders of ore mills, comprising a steel rim; two side disk plates of steel; V-shaped segment plates completely filling said steel rim and the space between the two disk plates, and a number of bolts of which one extends through each segment plate and through both disk plates.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN H. BUXTON.

Witnesses:

CHARLES B. MANN, Jr.,

G. FERD. VOGT.