Jan. 2, 1923.

1,441,147.

J. ENDERS.

QUARTZ MILL.

FILED DEC. 29, 1921.

FIG. 2.

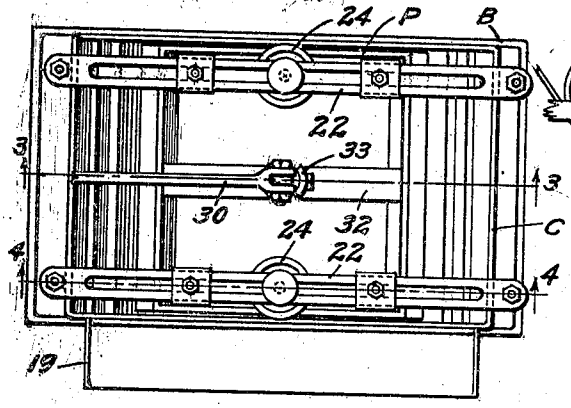


FIG. 1.

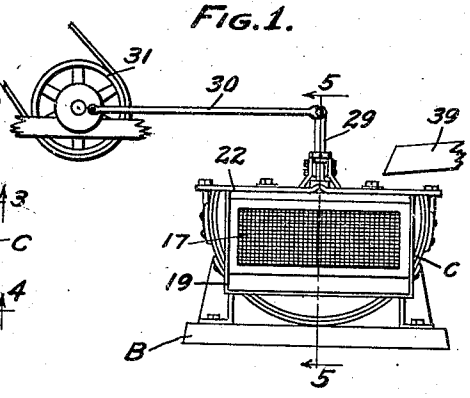


FIG. 3.

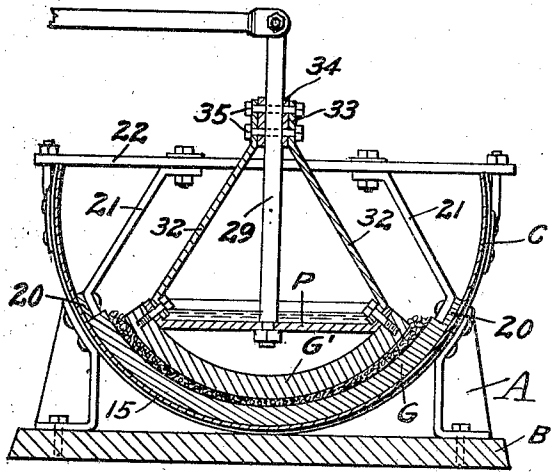


FIG. 5.

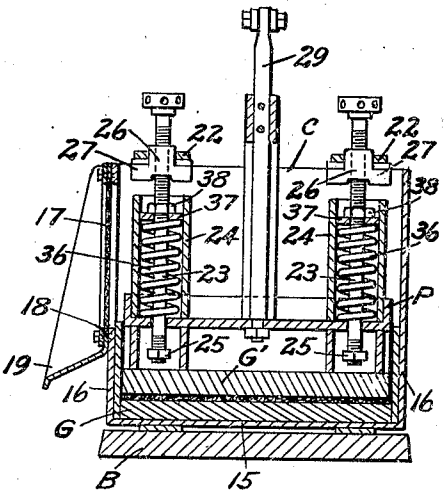
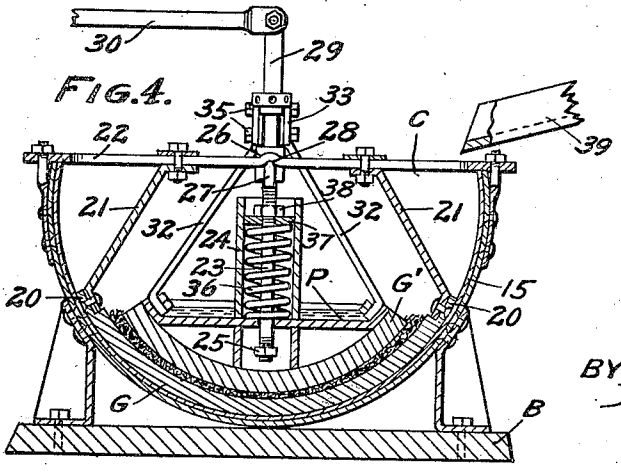


FIG. 4.



INVENTOR
JOHN ENDERS
BY Hazard & Miller
ATT'YS.

Patented Jan. 2, 1923.

1,441,147

UNITED STATES PATENT OFFICE.

JOHN ENDERS, OF SAN BERNARDINO, CALIFORNIA.

QUARTZ MILL.

Application filed December 29, 1921. Serial No. 525,675.

To all whom it may concern:

Be it known that I, JOHN ENDERS, a citizen of the United States, residing at San Bernardino, in the county of San Bernardino and State of California, have invented new and useful Improvements in Quartz Mills, of which the following is a specification.

My invention relates generally to grinding mills, and more particularly to mills for effecting the disintegration or reduction of mineral ores, such as quartz and the like.

A purpose of my invention is the provision of a grinding mill which operates to effect the complete reduction of ore to any desired degree of fineness by an adjustment of a movable grinding element with respect to a stationary grinding element, the mill being of such simple construction as to permit of its being made from boiler plate and consequently inexpensively manufactured.

It is also a purpose of my invention to provide a mill having ore concentrating means associated and acting in conjunction with the ore reduction means to simultaneously recover the valuable particles of the ore.

I will describe one form of grinding mill embodying my invention and will then point out the novel features thereof in claims.

In the accompanying drawings,

Figure 1 is a view showing in side elevation one form of grinding mill embodying my invention.

Fig. 2 is a top plan view of the mill shown in Fig. 1.

Fig. 3 is a view showing the vertical longitudinal section of the mill shown in the preceding views and taken on the line 3—3 of Fig. 2.

Fig. 4 is a view similar to Fig. 3 taken on the line 4—4 of Fig. 2.

Figure 5 is a central vertical transverse sectional view of the grinding mill shown in the preceding view.

Similar reference characters refer to similar parts in each of the several views.

Referring specifically to the drawings, and particularly to Figs. 3 and 5, my invention, in its present embodiment, comprises a container or tank designated generally at C which is rigidly supported in working position upon a base plate B by means of supports or standards A which are securely bolted to the container in base plate, as is clearly shown in Fig. 3.

The container C is of semicircular form, and in the present instance comprises an arcuate shaped plate 15 which forms the bottom and end walls of the container and side plates 16 suitably secured at their edges to the edges of the plate 15. As shown in Fig. 5, one of the plates 15 is formed with an opening which is spanned by a wire screen or other foraminous material 17 secured in position by a frame 18 of rectangular form. This frame 18 being removable permits of the removability of the screen 17, so that when the latter becomes worn, a new screen can be readily substituted. The frame 18 is provided at its side and bottom edges with flanges which constitute a spout designated at 19 through which the material is adapted to be discharged from the container.

As shown in Figs. 3 and 4, the container C has arranged therein a stationary grinding element as designated at G. This element is in the form of a steel casting of arcuate formation with its ends provided with flanges 20 to which are secured the lower ends of hangers 21. The upper ends of the hangers are in turn secured to slotted beams 22 spanning the upper edges of the container, in the manner clearly shown in Fig. 2. The mill also includes a movable grinding element designated at G′ which is constructed of the same material and in the same form, except that the radius of the arc upon which it is formed is less than the radius of the arc of the stationary grinding element G. This element G′ is supported for oscillatory movement within the container by means of threaded rods 23 arranged in cylinders 24 and provided with heads 25 at their lower ends for preventing their upward displacement, and provided at their upper ends with nuts 26 having bearing ears 27. The ears 27 are formed of relatively sharp edges which are disposed in notches 28 formed in the beams 22. This provides a bearing surface of practically negligible friction so that the actuation of the movable grinding element can be effected with small power consumption.

The rods 23 are slidably fitted in suitable openings formed in a concentrating pan designated at P which as shown in Figs. 3 and 4, is secured in spanning relation to the upper edges of the movable grinding element G with all of its edges upturned to confine the material which it is adapted to contain therein during the oscillation of the grinding

element. For actuating the grinding element, an arm or rod 29 is secured in an upstanding position on the pan P with its upper end connected to a link 30. The link 30 is in turn eccentrically connected to a wheel 31 to which power is adapted to be applied, it being understood however that any conventional mechanism may be employed for actuating the grinding element in that I do not wish to be restricted to the precise construction herein shown and described.

The rod 29 is maintained in upstanding position by brace bars 32 secured to the pan P in converging relation to each other and having their upper ends formed with arcuately curved extensions 33 which are clamped in secure engagement to a sleeve 34 by bolts 35, the sleeve embracing the rods as shown.

Coil expansible springs 36 surround the rods 23 and engage the pan P at their lower ends, while at their upper ends engage disc heads 37 slidably fitted within the cylinders 24, and such heads being maintained in any adjusted position by means of nuts 38 fitted on the rods 23.

By this arrangement it will be clear that the springs 36 normally urge the movable grinding element G' downwardly toward the stationary grinding element G, and that by an adjustment of the nuts 38 a variance in the tension of the springs can be secured, which in turn varies the degree of pressure with which the stationary grinding element is urged downwardly.

The operation of the mill is as follows: The ore together with the necessary amount of water is introduced into the top of the container through a spout 39 as shown in Figs. 1 and 4. The ore finds its way to a point between the elements G and G', and upon rotation of the wheel 31 oscillation of the movable grinding element G' is effected which, under the tension of the springs 36, effects a grinding or crushing of the ore between the elements. The grinding element G' as a unit swings about the bearing ears 27 as a center, and because of the formation of the bearings and notches it will be clear that the element moves with the least possible friction. If it is desired to increase the tension exerted upon the movable grinding element to increase the grinding action, it will be clear that by an adjustment of the nuts 38, such grinding action can be increased to the desired degree. This renders it possible to grind ore to any desired degree of fineness, which is of great value in the separation of ore.

The concentrating pan P is adapted to contain mercury or any other suitable concentrating agent, and during the oscillation of the movable grinding element the valuable particles of ore are deposited within the pan, that is, subsequent to the grinding process. As the grinding element oscillates the mercury operates to effect a concentration of the valuable particles of ore so that the recovery thereof is effected simultaneously with the grinding of the ore. It is to be understood that the liquid is continuously discharged from the container through the spout 19, the screen 17 serving to confine the valuable particles of ore within the container, as will be understood by those skilled in the art.

In the foregoing description taken in conjunction with the accompanying drawings, it will be manifest that I provide a mill which is of extremely simple and efficient construction in that the container can be constructed of boiler plate, and that the grinding elements can be readily cast at a small expense. The mounting of the movable grinding element permits of its easy operation, the small consumption of power, so that the mill in its entirety can be constructed and operated economically.

What I claim is:

1. A grinding mill comprising a stationary grinding element, a movable grinding element mounted for oscillatory movement and adapted to coact with the stationary grinding element, and a concentrating pan disposed above and movable with the movable grinding element.

2. A grinding mill comprising a stationary grinding element, a movable grinding element for oscillatory movement and adapted to co-act with the stationary grinding element, and a concentrating pan movable with the movable grinding element.

3. A grinding mill comprising a container, a stationary grinding element within the container, a movable grinding element, both of said elements being of arcuate form, beams sustained on the container, rods movably associated with the movable grinding element, bearing ears carried by the rods and engageable with the beams to provide an axis about which the movable grinding element is adapted to oscillate, springs along said rods for urging the movable grinding element toward the stationary grinding element, and nuts mounted on the rods and adjustable to vary the tension of said springs.

4. A grinding mill comprising a container, a stationary grinding element within the container, a movable grinding element co-acting with the stationary grinding element and mounted for oscillatory movement, a pan secured to the movable grinding element, rods slidably fitted in the pan, cylinders surrounding the rods, expansible springs surrounding the rods and interposed between the cylinders, heads mounted on the rods and engageable with the springs, and nuts adjustable to vary the position of the heads to increase or decrease the tension of the springs for the purpose described.

5. A grinding mill comprising a station-

ary grinding element, a movable grinding element, beams sustained above the elements, rods movably associated with the movable grinding element and engaging said beams to provide pivots for the movable grinding element, and adjustable and yieldable means for urging the movable grinding element toward the stationary element.

6. A grinding mill comprising a container, a stationary grinding element within the container, beams sustained on the container and formed with slots, brace bars secured to the grinding element, means adjustable within the slots of said beams for securing the bars to the beams, a movable grinding element, rods movably associated with the movable grinding element, bearing ears threaded on the rods and engageable with the beams to provide an axis about which the movable grinding element is adapted to move, and yieldable means for urging the movable grinding element toward the stationary grinding element.

7. A grinding mill comprising a container, a stationary grinding element within the container, a movable grinding element, both of said elements being of arcuate form, beams sustained on the container, rods movably associated with the movable grinding element, bearing ears carried by the rods and engageable with the beams to provide an axis about which the movable grinding element is adapted to oscillate, resilient means associated with said rods for urging the movable grinding element toward the stationary grinding element, and means mounted on the rods and adjustable to vary the tension of said springs.

In testimony whereof I have signed my name to this specification.

JOHN ENDERS.