Oct. 7, 1930. J. P. VAN GELDER 1,777,905

GRINDING MILL OF THE SWING HAMMER OR BEATER TYPE

Filed July 29, 1929

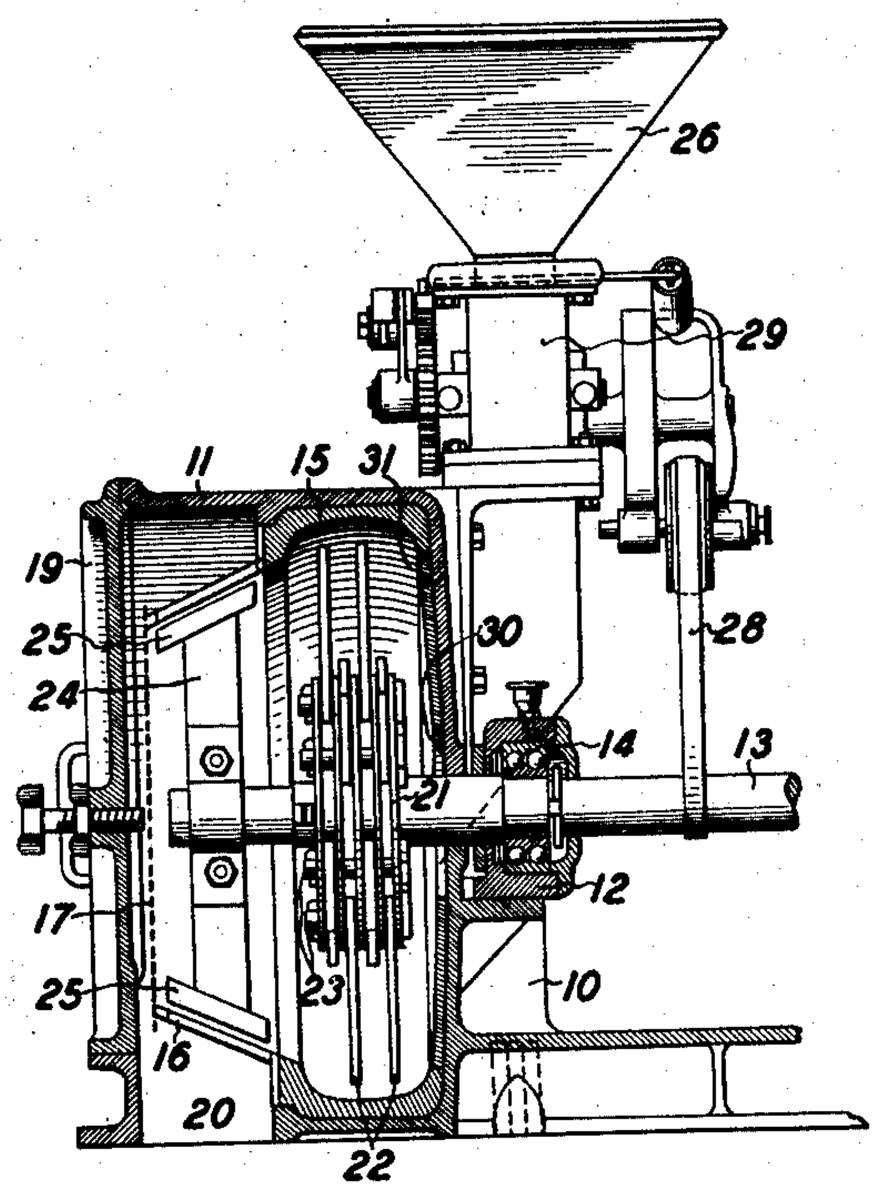

FIG. 1.

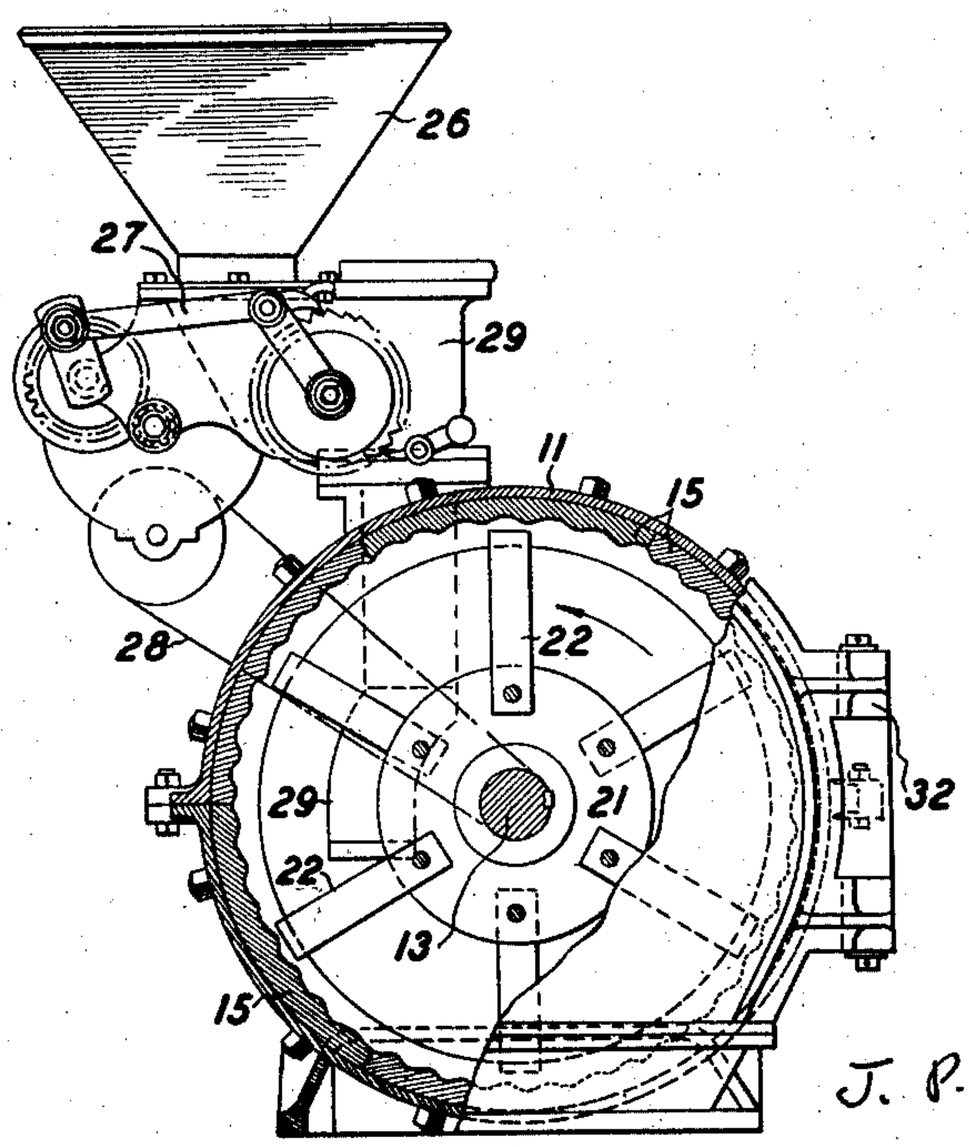

FIG. 2.

J. P. Van Gelder
INVENTOR

By: Marks & Clerk
Attys.

Patented Oct. 7, 1930 1,777,905

UNITED STATES PATENT OFFICE

JOHANNES PIETER VAN GELDER, OF GRANVILLE, NEAR SYDNEY, NEW SOUTH WALES, AUSTRALIA

GRINDING MILL OF THE SWING-HAMMER OR BEATER TYPE

Application filed July 29, 1929, Serial No. 381,824, and in Australia August 16, 1928.

This invention relates to grinding mills of swing hammer or beater type from which the ground product is delivered through screens which retain the oversize particles. It has been devised to obviate practical difficulties which are encountered more particularly when screens of fine gauge are used; such screens when fitted in the beater chamber have not the necessary mechanical strength for withstanding the impact and attrition of flying particles of stock under treatment.

In mills according to the present invention, the screen is fitted in a screening chamber in one of the end covers of the beater chamber, and deflector blades are fitted on the overhung end of the mill shaft in the screening chamber to deflect coarse particles back from the screens into the beater chamber; these blades also operate to prevent packing up of product on the screen.

The beater chamber is a circular drum or ring and the beater shaft is disposed horizontally axially therein. The shaft bearings are in one end of the chamber on the bed plate on which the chamber is built, and the shaft is overhung. Swing hammers or beater arms are fitted on the shaft within the beater chamber and the feed is taken into the beater chamber through a tangentially disposed vent in the end cover of the chamber which is contiguous to the shaft bearing.

The screen is contained in a separate chamber which is an endwise extension of the beater chamber and is fully open thereto. In the screen chamber a lantern frame is set up to carry a frustro-conical shape ring screen. The base part of this screen is fully open to the end of the beater chamber and the overhanging end of the shaft projects into it. Upon this part of the shaft two or more blade headed arms are fitted, the blades being disposed angularly to the shaft axis; these blades sweep over the interior face of the screen annulus but do not touch it. The fine material which the screen passes goes into the end of the mill chamber in which the screen is housed, and falls thence down through a bottom delivery vent.

As grinding proceeds, the finer product is carried out of the far end of the beater chamber in the air draft which is produced by the centrifugal action of the beaters, and passes through the screen. The agitation and the centrifugal blast effect of the bladed arms in the screen chamber operate to facilitate passage of this fine product through the screen. The coarser particles which the screen will not pass are whirled by the blades and by reason of the angular disposition of the blades they are deflected back into the beater chamber where they undergo further reduction, and ultimately pass back to the screen.

The screens are not subjected to impact of the particles upon them or to destructive attrition by coarse particles, and they are kept free for passing fine grade product. The capacity of a mill on this principle is high, assurance of uniformity of grade of product is obtained, and a material saving is effected because the screens are not injured, and stoppages for making screen replacements are obviated.

In the accompanying drawings:—

Fig. 1 is a vertical longitudinal sectional elevation of the mill; and

Fig. 2 is a vertical transverse sectional elevation taken through the beater chamber.

10 is a bed plate with which the casing 11 and the shaft bearing seat 12 are integral. The shaft 13 is carried in the bearing 14 and the part of it which is within the casing 11 is overhung. 15 is a liner ring of torus section, and preferably corrugated on its interior face. It is fitted within the beater chamber. 16 is a lantern frame which is fitted within the screen chamber. The dished sides of the frame 16 and the end of it are clothed with wire gauze or perforated sheet or other suitable screen 17 of gauge appropriate to the grade of product required. The outer end of the screen chamber is closed by a cover 19, and a vent 20 is formed in the bottom of that chamber. 21 are discs keyed on the shaft, and 22 are swing hammers hung by pivots 23 between these discs. 24 are radial arms keyed on the overhung end of the shaft, and 25 are paddle blades pitched angularly, and fixed on these arms. 26 is a feed hopper, 27 a pawl

and detent type feeder driven by a belt 28 from the shaft, and 29 is the feed spout leading from the feeder into a port 30 in the inner end cover part 31 of the casing. 32 is an access gate in the side of the casing.

In operation, the stock to be milled is charged into the hopper 26 and is delivered by the feeder 27 at an uniform rate into the feed port 30, whence it falls into the beater ring or drum. It is there whirled and smashed by the action of the swing hammers, and the finer part of the product passes into the screen, goes through the screen, and passes out through the delivery vent 20. The screen is kept free by the air scour produced by the revolving blades 25, and particles which will not pass through the screen are swept back by these blades into the beater chamber to suffer retreatment therein. The frustro-conoidal shape of the screen facilitates this return of the coarser grade particles to the beater chamber.

What I claim as my invention and desire to secure by Letters Patent is:—

1. A swing hammer or beater type grinding mill including a casing having two chambers one of which forms a beater chamber, a fixed screen of frustro-conoidal shape in the other chamber in the casing, the side walls and one end of said screen being clothed with screening material, a shaft end overhung in the screen chamber, and angularly pitched blades carried on the shaft within said latter chamber and adapted for returning to the beater chamber the milled particles which will not pass through the screen.

2. A grinding mill comprising a horizontally disposed cylindrical casing, a torus ring liner occupying a portion of the length thereof to form a beater casing, a screen of frustro-conoidal shape occupying the remainder of the length of said chamber, said screen being of lesser diameter than the interior of the torus ring liner, and having its sides and one end clothed with screening material, means for introducing the feed into the beater chamber, means for permitting removal of the screened product from the screen chamber, a rotatable shaft axially disposed in said casing, beating hammers swingably mounted on said shaft adapted to co-act with the torus ring liner to pulverize the feed, and angularly pitched blades also carried on said shaft, said blades adapted for promoting discharge of fine product through the screens and for returning coarse product to the beater chamber to effect repeated pulverization.

3. A grinding mill including a casing provided with two chambers, a feeder thereon arranged for delivering measured quantities of feed into one of the chambers, a bearing at one end of the casing, a shaft journaled in the bearing and projecting into the casing, a torus ring liner within one of the chambers in the casing, hammers swingably mounted on the shaft for coacting with the ring liner, a lantern frame of frustro-conoidal shape having a perforated covering and being smaller in diameter than the adjacent open side of the ring, a discharge vent at the bottom of the chamber accommodating the perforated frame, and arms terminating in angularly pitched blades on the outer end of the shaft and within the screened frame, substantially as and for the purposes set forth.

4. A swing hammer or beater type grinding mill comprising a horizontally disposed cylindrical casing, a torus ring liner occupying a portion of the length thereof to form a beater chamber, a lantern frame of frustro-conoidal shape occupying the remainder of the length of the casing, a perforated covering on said frame, the frame being of lesser diameter than the interior of the torus ring liner, a rotatable shaft axially disposed in said casing, a bearing for the overhung shaft arranged externally of the casing, swing hammers mounted on said shaft adapted to coact with the torus ring liner to pulverize the feed, arms extending from the shaft and terminating in angularly pitched blades for coacting with the screen, a feeder arranged on the casing for delivering measured quantities of feed into the closed end of the beater chamber, and a discharge vent at the bottom of the chamber housing the lantern frame, substantially as and for the purposes set forth.

In testimony whereof I affix my signature.

JOHANNES PIETER VAN GELDER.