G. E. SOVEREIGN.

GRINDING MILL.

APPLICATION FILED AUG. 10, 1907.

942,357.

Patented Dec. 7, 1909.

4 SHEETS—SHEET 1.

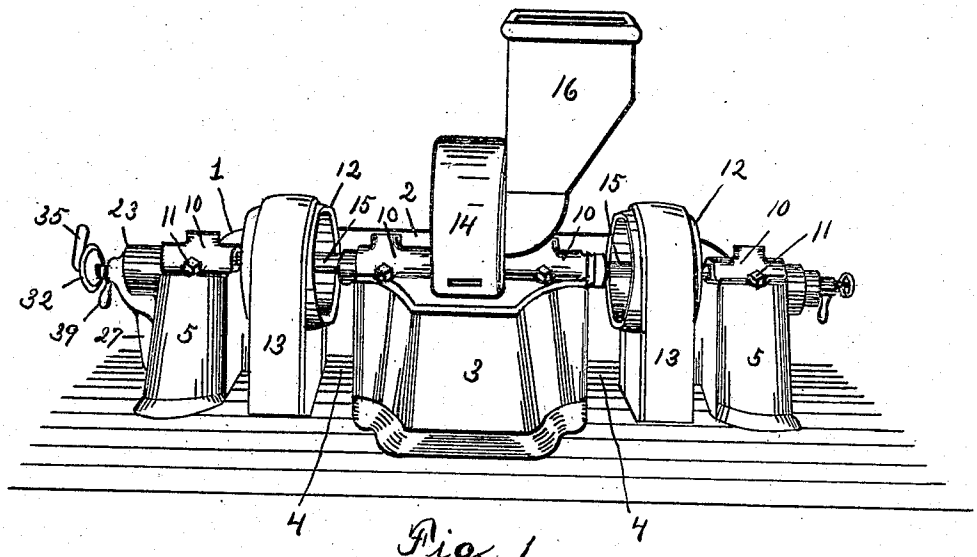


Fig. 1.

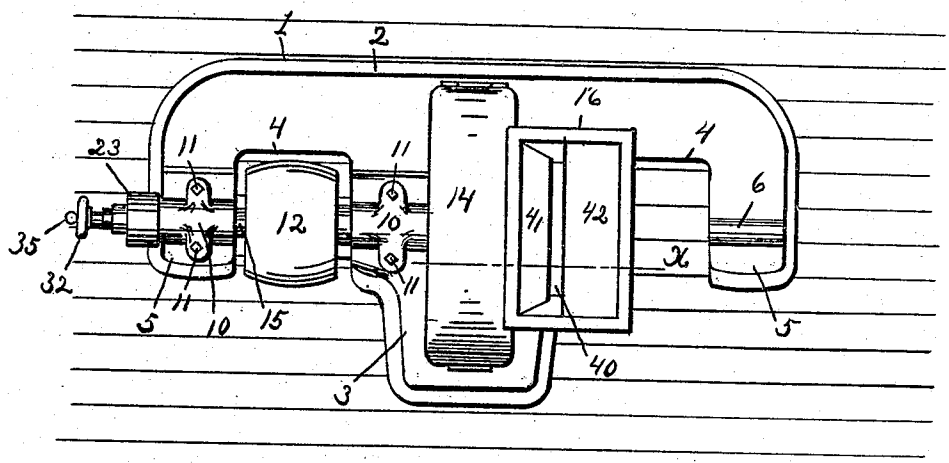
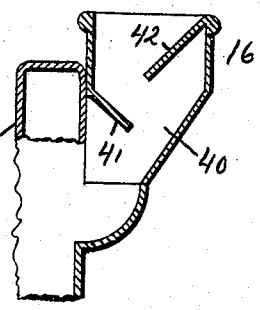


Fig. 2.

Fig. 3.



WITNESSES

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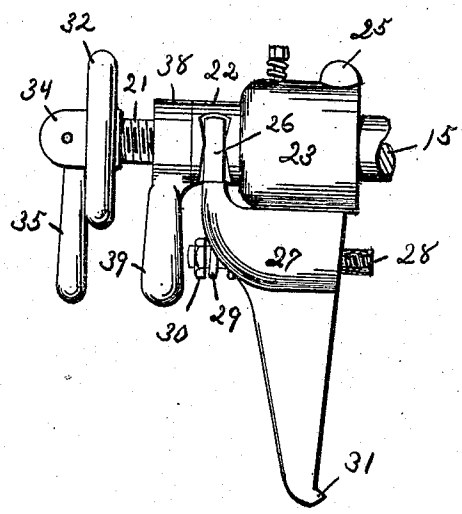

Fig. 4.

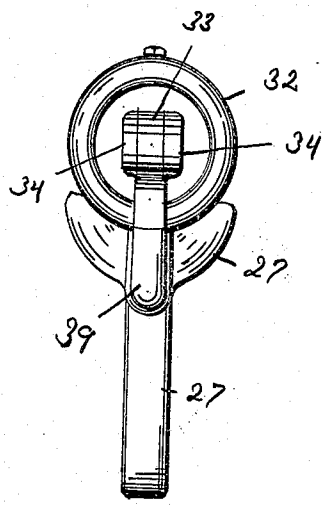

Fig. 5.

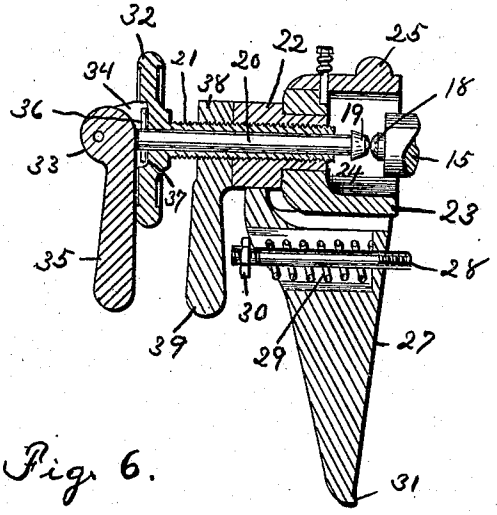

Fig. 6.

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4 SHEETS—SHEET 3.

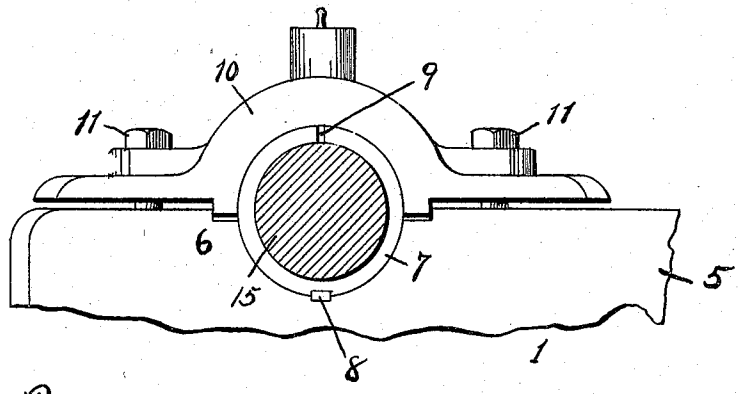

Fig. 7

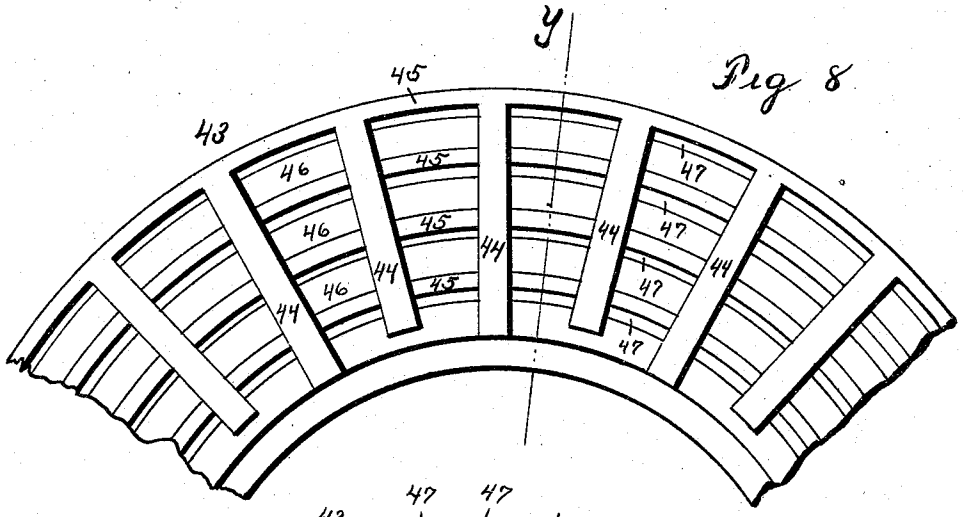

Fig. 8

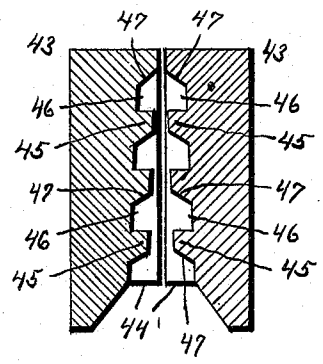

Fig. 9.

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4 SHEETS—SHEET 4.

Fig. 10

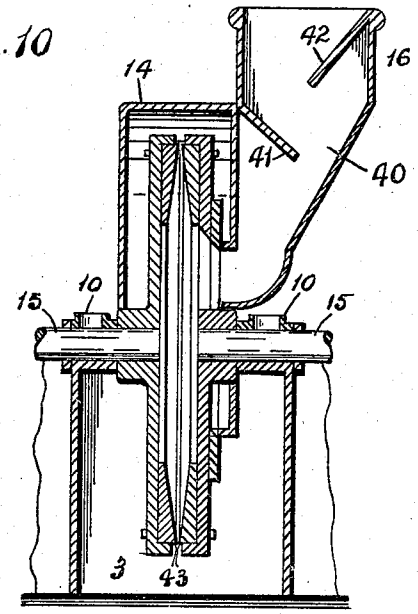


Fig. 11

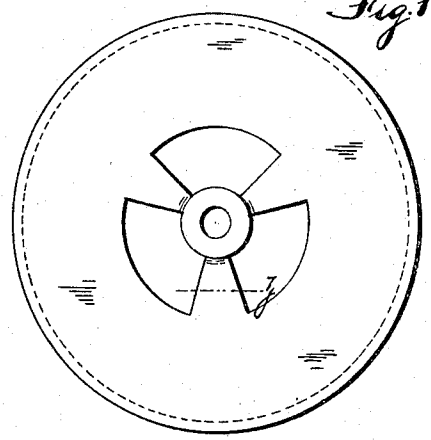
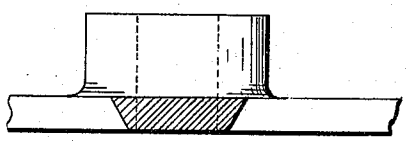


Fig. 12



WITNESSES

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UNITED STATES PATENT OFFICE.

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GRINDING-MILL.

942,357. Specification of Letters Patent. Patented Dec. 7, 1909.

Application filed August 10, 1907. Serial No. 388,019.

To all whom it may concern:

Be it known that I, GEORGE E. SOVEREIGN, a citizen of the United States, residing at Pottersville, in the county of Hunterdon and State of New Jersey, have invented certain new and useful Improvements in Grinding-Mills, of which the following is a specification.

The objects of this invention are to secure an improved bed or frame for the grinding mill, which shall be firm and rigid to hold the moving parts of the mill in their proper relation or alinement and yet at the same time permit ready access to all said parts; to secure improved shaft bearings upon the said bed or frame; to provide the adjusting means for varying the relation of the grinding disks with a quick-release device of improved construction; to enable the grinding disks to be positively and accurately returned to their original position after having been separated by the quick-release device; to obtain simplicity of construction and convenience in such a device; to provide an improved grinding disk, which shall expedite and facilitate the passage of the material through the grinding mill, and insure its more thorough grinding; to provide a hopper which will positively retain and feed to the grinding disks material placed therein, and to obtain other advantages and results as may be brought out in the following description.

Referring to the accompanying drawings, in which like numerals of reference indicate corresponding parts in each of the several figures, Figure 1 is a perspective view of my improved grinding mill from the front, and Fig. 2 is a plan of the same, one of the driving pulleys being removed to show the construction of its bearings more clearly; Fig. 3 is a vertical section of the hopper taken on line x, Fig. 2; Fig. 4 is a side elevation of the quick-release device employed at one end of the grinding mill, and Fig. 5 is an end view of the same; Fig. 6 is a vertical central section of said quick-release device; Fig. 7 is an end view of one of the shaft bearings of my improved grinding mill; Fig. 8 shows a portion of one of the grinding disks, looking at its face; Fig. 9 is a cross-sectional view, as on line y, Fig. 8, of the two grinding disks as they coöperate; Fig. 10 is a central vertical section through the grinding disks and adjacent portions of the mill, taken longitudinally of the grinding disk shafts; Fig. 11 is a view from its outer side of one of the heads which support the grinding disks proper; and Fig. 12 is a detail section of the same on line z of Fig. 11.

In said drawings, 1 indicates the body or frame of the mill, and which is a hollow or box-section casting of great strength and stiffness because of its formation. In plan this frame is of E-shape, approximately, having a main portion 2 extending longitudinally of the mill at the rear thereof. At the front of said main portion and forwardly projecting therefrom is the hollow central portion 3, the interior of which forms a chamber to receive the hereinafter mentioned grinding disks, and separated from this central portion 3 by recesses or bays 4 for the pulley wheels 12 and belts 13 on the driving shafts 15, are other forwardly projecting box-section pedestals 5. Said main portion 2 of the frame and the central portion 3 and end portions 5, 5, all have their bases in substantially the same plane and adapted to firmly and stably engage the floor, while at the tops of the central portion 3 and end portions 5, 5 are alined bearings 6 for the driving shafts 15. This bed or frame 1, it will be understood, is made all in one piece, so that after being cast it can be put into a mill and the several shaft bearings for its entire length bored out at one operation. Perfect alinement of said bearings, one of which is shown at 6 in Fig. 2, is therefore secured, and furthermore an alinement which is fixed or established and cannot be disturbed by shipping or setting up the mill. Each bearing 6 preferably receives a bushing 7 in the form of a split sleeve, said bushing being keyed at its lower part to the bed, as at 8, and having its single slit 9 at the top. A cap 10 extends over the shaft, inclosing the bushing 7, and is bolted to the bed frame, as at 11. These shaft bearings are located about midway of the length of each of the end arms or extensions 5, and thus the recesses, 4, 4 described, afford space for the driving pulleys 12 and belts 13 thereon. It will be noted that these belts extend downward through the floor or other support upon which the bed of the mill stands, and that the said recesses 4 afford a clear opening for the same out at the bottom of the mill. The middle portion 3 of the said frame is for its central part devoid of the bearings which have been described for the

shafts, and is provided with an upward extension 14 which enlarges the inner chamber of the bed frame sufficiently to receive the grinding disks, which are mounted on the ends of the shafts 15. The said disks therefore rotate in the space provided by the hollow bed 1, the extension 14 and any further necessary space which may be obtained by cutting through the floor. The said extension 14 is preferably hinged at one end to provide access to the grinding plates, as usual, and supports a feeding hopper 16, with the other accessory attachments commonly found in grinding mills. The said hopper 16, referring more particularly to Fig. 3, is provided with a passage 40 which leads to a point adjacent to one of the disks and near the center thereof, said disk having an opening opposite the end of such passage adapted to permit material discharged from said passage to fall into the space between the two disks. In the said passage 40, at or near its entrance, I have provided baffle plates 41, 42 to prevent material poured into the hopper from being blown out of the same, as the speed at which the grinding disks are rotated creates a circulation of air upward and downward through the said passage 40. Said baffle plates are both inwardly or downwardly inclined, so as not to obstruct the entrance of grist, and are preferably arranged one, 41, on the inner wall of the hopper next the grinding plates and the other on the opposite wall. The plate 41 is nearer the inner end of the hopper passageway, and projects half-way, more or less, across the same, while the other baffle plate is nearer the mouth of the hopper and so disposed that any matter blown outwardly past the inner baffle plate 41 passes, and is caught, behind the outer plate 42. There is thus no egress from the hopper.

It will be understood that one of the shafts 15 is adjustable longitudinally to provide for regulating the relation of the grinding disks, and means for securing such adjustment is provided at one end of the grinding mill. These means I have shown in detail in Figs. 4, 5 and 6, and which will now be more particularly described.

The end of the shaft 15, which projects beyond the bed frame 1, is provided with a hardened reduced extremity 18, which is engaged by the head 19 of a pin 20 arranged in longitudinal alinement with the shaft. Said pin is loosely inclosed in a threaded shaft 21 which is adapted to screw in a bushing 22 to force the said pin 20 toward or away from the shaft 15. This bushing 22 carries at its end next the bed-frame of the mill, a casting 23 which provides an interior chamber 24 around the point of contact of the pin 20 and shaft 15, said chamber being provided at the top with a cover 25 by means of which access may be had to the said pin and shaft to lubricate the same or otherwise. The said bushing 22 is supported by the forked arm 26 of a bracket 27, which is held as by a screw 28, against the end of the bed-frame, a spring 29 being placed in a cavity of said bracket between the same and a nut 30 on the holding screw. The lower end of the bracket 31 bears against the bed-frame of the mill, and under severe sudden pressure upon the grinding disks to separate them, obviously the shaft 15, bushing 22 and bracket 27 may all be forced outwardly away from the bed-frame against the spring 29, the lower end 31 of the bracket acting as a fulcrum.

To further provide for separating the grinding disks, if desired, and afterward returning them accurately and exactly to their original position, I have provided upon the outer side of the hand-wheel 32 by which the screw 21 is turned, an eccentric 33, adapted to bear against the outer end of the pin 20. This eccentric is preferably mounted between lugs 34 upon the hand-wheel 32 in a diametric relation to the said wheel and having a handle 35 by means of which it can be worked. The edge of the eccentric head always lies at its inner part against the pin 20, and therefore the hand-wheel 32 and its screw may be operated as readily and effectually as if the eccentric were not present. At the same time, if it is desired to separate the grinding disks a little and then return them to the same position again, this can be done by the eccentric much more readily than by the hand-wheel.

A cross-pin 36 in the pin 20, and lying in an outer recess 37 of the hand-wheel 32, insures the pin following outwardly the hand-wheel when unscrewed. Preferably, also, a lock nut 38 with handle 39 is provided upon the screw shaft 21.

The grinding disks or plates employed in my improved mill are shown more particularly in Figs. 8 and 9 of the drawings. Each grinding plate or disk 43 is provided at its inner or working face with a plurality of radial ribs 44 and annular ribs 45 intersecting each other, whereby pockets 46 are provided therebetween. The said annular ribs 45 serve to retard the outward progress of the material under centrifugal force, and to direct the same toward the other grinding plate, and the radial ribs 44 act as cutters to reduce the material being ground. Furthermore, the walls of said annular ribs are preferably beveled at their sides next the center of the disk, as at 47, and which feature is shown in my prior application filed Nov. 13, 1906, Serial No. 343,257.

The radial or cutting ribs 44 of the two coöperating grinding disks have parallel faces for their entire length, and thus always have the same shear or cut in their

action. The annular ribs 45 of the two disks, however, have their faces lying in planes which converge radially outward, or in other words, the innermost annular flange is considerably lower than the radial ribs 44, and each outwardly succeeding annular rib increase in height until the maximum height of the radial ribs is attained. The effect of this construction is not only that the radial ribs at all points have the same cut, but the annular ribs also insure that only particles of material which require reducing are submitted to the action of said radial ribs. Particles already too small to need grinding pass along radially outward over the annular ribs at the side of the radial rib they have engaged, below its cutting face, and thus not only are the radial ribs kept clear for their cutting action upon such particles as need it, but also friction is reduced by the prompt discharge of the ground material and greater coolness in the ground product is secured. Furthermore, the fact that particles once reduced to the desired size are not again passed between the radial cutting ribs, is of great importance in reducing to a granular product which shall be free from powder or dust such as would be caused by grinding and re-grinding. Particles once reduced pass radially outward along the cutter ribs below their faces, and only those pieces which need grinding are sheared by said faces.

My improved construction of grinding disks also requires the expenditure of less power in operating the mill, for the above reasons, and is thus economical and more durable.

The present application, it should be noted, is to a large extent a division of my prior application above referred to, Serial No. 343,257, filed November 13, 1906.

Having thus described my invention, what I claim as new is;

1. The combination with a supporting frame, a shaft adapted to be moved longitudinally therein and coöperating disks one mounted on said shaft, of a pin in longitudinal alinement with said shaft and engaging the end thereof, a hollow screw inclosing said pin, threaded bearings for said screw, and a diametrically disposed cam on the end of said screw engaging said pin.

2. The combination with a shaft adapted to be moved longitudinally, bearings for said shaft, and coöperating disks one mounted on the shaft, of a hollow screw in alinement with said shaft and provided with a hand wheel, a pin in said screw adapted to engage the end of the shaft, a cross-pin limiting inward movement of said pin with respect to the screw, a cam pivoted upon the said hand wheel and adapted to engage said pin to force the same inward, and threaded bearings for said screw.

3. The combination with a bed frame, a shaft movable longitudinally therein and coöperating disks one mounted on said shaft, of a bracket upon the end of said frame, a bolt securing said bracket to the frame intermediate of its upper and lower ends, a spring between said bracket and head of the bolt, and means carried by the upper end of said bracket for adjusting the position of said longitudinal shaft, the lower end of the bracket abutting against the bed frame.

4. The combination with a longitudinally movable shaft, bearings for said shaft and coöperating disks one mounted on said shaft, of a vertically disposed bracket resiliently attached intermediate of its ends to a fixed support and engaging the same at its lower end, the upper end of said bracket being forked, a bushing mounted in said forked end of the bracket, a lubricating casing between said bushing and the shaft, and means carried by said bushing for adjusting said shaft longitudinally.

5. In a grinding mill, a grinding disk provided on its face with a series of alternate annular grooves and ribs which ribs increase in height outwardly, and radial ribs intersecting said annular ribs and having continuous faces lying in the plane of the face of the outer annular rib.

6. In a grinding mill, the combination of a pair of rotary grinding disks arranged face to face in grinding relation to each other, each of said disks having on its face a series of alternate annular grooves and ribs and radial ribs intersecting said annular grooves and ribs, the faces of the annular ribs of said disks lying in outwardly converging surfaces and the faces of the radial ribs of said disks lying in parallel planes.

7. In a grinding mill, the combination of a pair of rotary grinding disks arranged face to face in grinding relation to each other, each of said disks having on its face a series of alternate annular grooves and ribs and radial ribs intersecting said annular grooves and ribs, the faces of the annular ribs of said disks lying in outwardly converging surfaces and the faces of the radial ribs of each disk coinciding with the face of the outer annular rib on that disk and being higher than the faces of the other annular ribs thereon.

GEORGE E. SOVEREIGN.

In the presence of—
C. D. SOVEREIGN,
A. J. SOWERS.