

G. McCRAE.
PULVERIZER OR GRINDING MACHINE.
APPLICATION FILED FEB. 12, 1921.

1,401,716.

Patented Dec. 27, 1921.

2 SHEETS—SHEET 1.

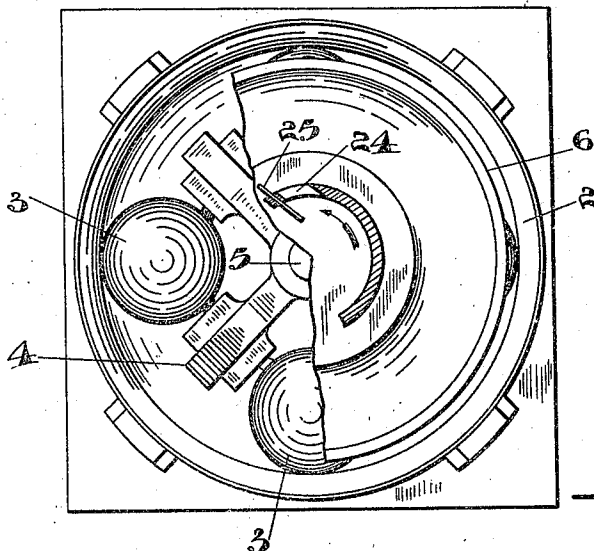


FIG. 1.

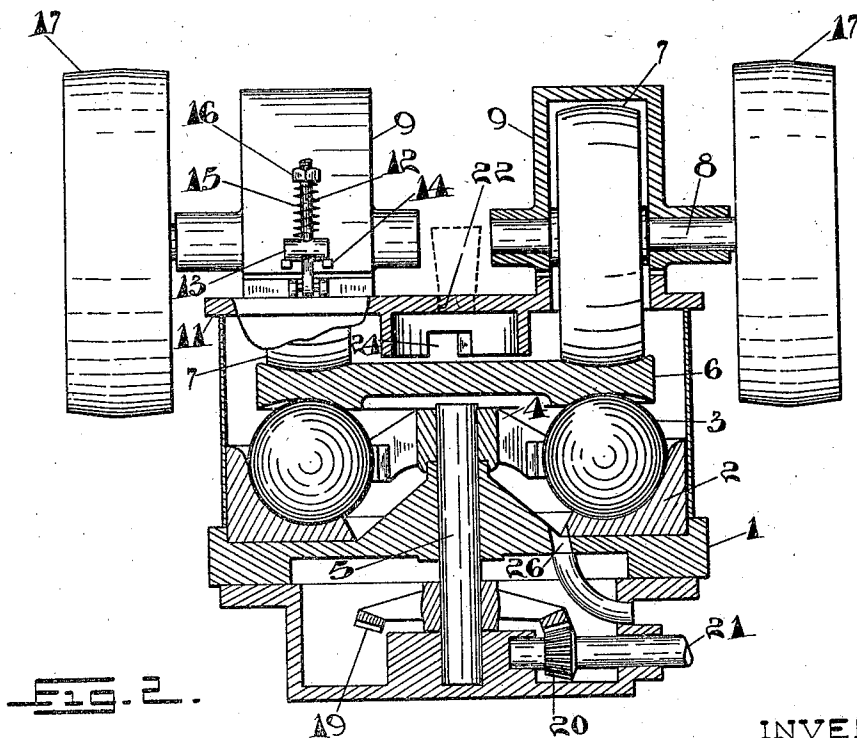


FIG. 2.

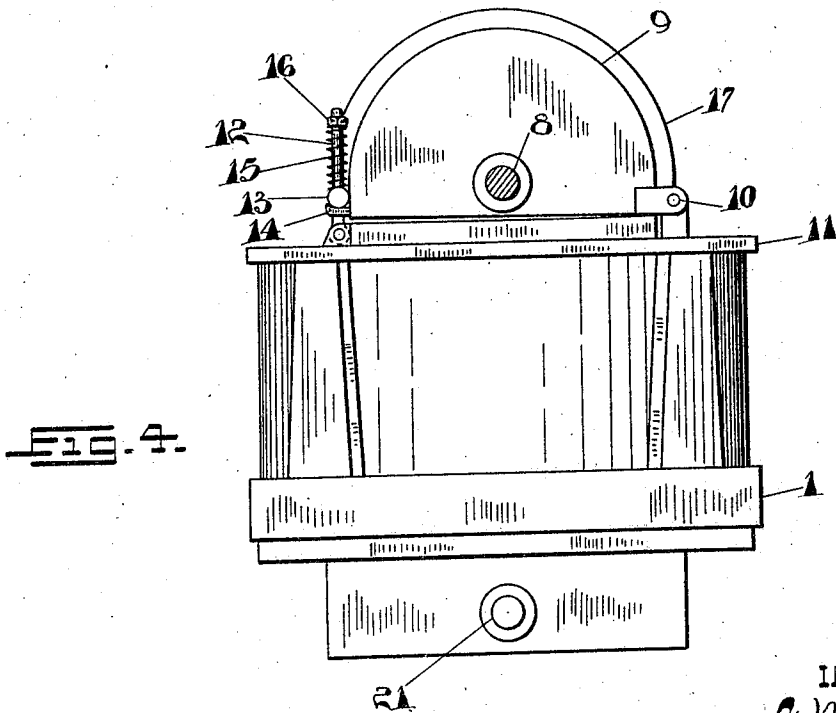
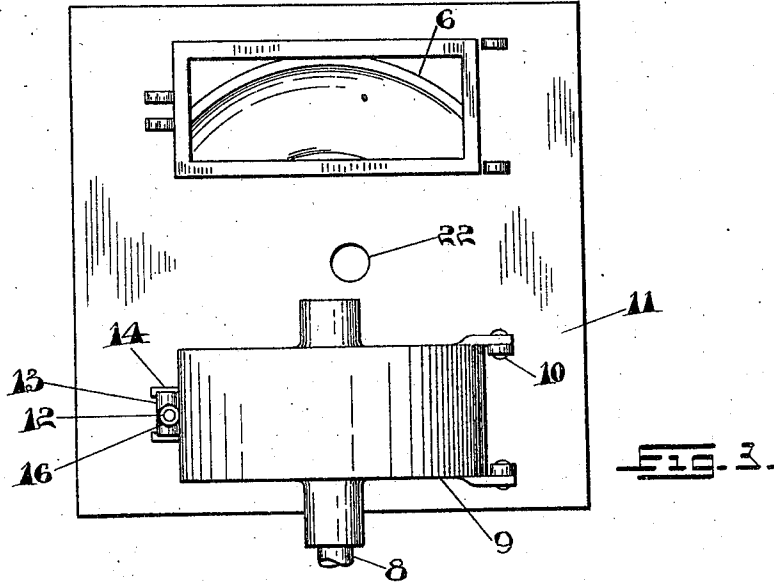
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UNITED STATES PATENT OFFICE.

GEORGE McCRAE, OF BRANTFORD, ONTARIO, CANADA.

PULVERIZER OR GRINDING-MACHINE.

1,401,716.

Specification of Letters Patent. Patented Dec. 27, 1921.

Application filed February 12, 1921. Serial No. 444,462.

To all whom it may concern:

Be it known that I, GEORGE McCRAE, of the city of Brantford, in the county of Brant, Province of Ontario, Canada, a subject of the King of Great Britain, have invented certain new and useful Improvements in Pulverizers or Grinding-Machines, of which the following is a specification.

This invention relates to machines for pulverizing ores, limestone, clinker, coal and the like, and my object is to devise a simple compact machine which will take material of comparatively large size, say up to that which will pass a screen of 2" mesh, and discharge it in a pulverulent condition.

I attain my object by means of the constructions hereinafter described and illustrated in the accompanying drawings in which—

Figure 1 is a plan view of my improved apparatus with the top removed, some of the remaining parts being partly broken away;

Fig. 2 a vertical section of the device;

Fig. 3 a plan view; and

Fig. 4 a side elevation.

In the drawings like numerals of reference indicate corresponding parts in the different figures.

At the lower part of the frame 1 is supported a grinding plate 2, which is preferably set in a recess of the frame so that it may be readily removed and replaced. On this plate operate rolling grinding members 3 which are preferably formed as balls, the grinding plate being suitably shaped in section for cooperation therewith. These balls are preferably held in spaced relationship by the arms of a cage 4 journaled on a vertical spindle 5.

Above the rolling grinding members is located a floating grinding plate 6, which rests on the tops of the rolling grinding members 3. Rotary grinding members 7 are suitably supported above the floating grinding plate so as to cooperate with the upper surface thereof. These rotary grinding members are preferably formed as rollers secured to shafts 8 journaled in bearings in the rock arms 9 fulcrumed at 10 on the top 11 of the frame. These arms are normally held down by spring latches, each comprising a bolt 12 hinged on the top of the machine carrying a sliding member 13 adapted to engage lugs 14 on the end of the rock arm. A spring 15 engages the sliding member and a nut 16 threaded on the end of the

bolt. By tightening up the nut, the tension on the rock arm may be varied as desired. A pulley 17 is secured to the outer end of each shaft 8 whereby the shafts may be driven from any suitable line shafting. Direct electric motor drive might, of course, be substituted.

From the construction described, it follows that if the rotary grinding members 7 are suitably rotated that the floating grinding plate will be rotated and that by frictional engagement with the rolling ball members 3 the latter will be caused to travel around over the surface of the fixed grinding plate 2. I may, however, drive the rolling grinding members and therefore provide the spindle 5 with a bevel gear wheel 19 secured to its lower end, which meshes with a bevel pinion 20 fast on the horizontal shaft 21 suitably journaled on the lower part of the frame of the apparatus. The cage may thus be rotated to insure proper rolling of the balls.

The material to be pulverized is fed into the top of the apparatus through an opening 22, into which the lower end of a suitable hopper may be fitted. From this opening the material drops on to the top of the floating grinding plate and works toward the outer edge thereof, where it passes between the rotary grinding members and the part of the grinding plate 2 engaged thereby. Preferably the grinding plate 2 has its grinding surface concavely curved in cross section and the rotary grinding members are correspondingly shaped as shown.

To give a positive controllable feed of the material to be ground, I preferably form the depending annular flange on the under side of the top 11 which extends down comparatively close to the upper surface of the grinding plate. Through this flange one or more openings 24 are formed through which the material may pass. The passage of material through these openings may be controlled by means of sliding plates or vanes 25, which may be projected for a greater or lesser extent into the mass of material resting on the upper surface of the floating grinding plate and rotating therewith. These vanes will thus plow off to direct the material more or less rapidly through the openings 24 to the grinding surface, according to the extent of their projections. If the blades are made a frictional fit in the slots in the flange through which they

pass, they will remain in any position to which they are moved. The material, which has its first or coarse grinding under the rotary grinding members 3, flows over the outer periphery of the floating grinding plate and falls on to the outer part of the fixed grinding plate 2. Final grinding takes place on this fixed grinding member under the rolling grinding members 3, and the ground material is discharged through one or more openings 26 in the bottom of the frame. The discharge from these openings may be led away in any known manner for final disposal.

I find that more or less material is carried up adhering to the surface of the balls, which material is ground between the balls and the under surface of the plate 6, which is preferably slightly grooved for coöperation with the balls.

It will be understood, of course, that any modification of the construction which permits of yielding contact between the rotary and rolling grinding members and the grinding plates will fall within the scope of my invention.

What I claim as my invention is:—

1. In a grinding mill, the combination of a casing; a non-rotatable grinding plate at the lower part of the casing; a floating grinding plate supported above the non-rotatable plate; freely rolling grinding members holding said plates in spaced relationship; rotary grinding members adapted to coöperate with the upper surface of the

floating grinding plate and to drive the same; bearings for said rotary grinding members movable to and from the floating grinding plate; and means for directly rotating said members.

2. In a grinding mill, the combination of a casing; a non-rotatable grinding plate at the lower part of the casing; a floating grinding plate supported above the non-rotatable plate; freely rolling grinding members holding said plates in spaced relationship; directly driven rotary grinding members adapted to coöperate with the upper surface of the floating grinding plate and to drive the same; and means permitting yielding contact between the rotary and rolling grinding members and the grinding plates.

3. In a grinding mill, the combination of a casing; a non-rotatable grinding plate at the lower part of the casing; a floating grinding plate supported above the non-rotatable plate; freely rolling grinding members holding said plates in spaced relationship; rotary grinding members adapted to coöperate with the upper surface of the floating grinding plate and to drive the same; rock arms fulcrumed at the top of the frame provided with bearings; and a spindle journaled in each rock arm to which one of said rotary grinding members is connected.

Signed at Brantford this fourth day of February, 1921.

GEORGE McCRAE.