

(No Model.)

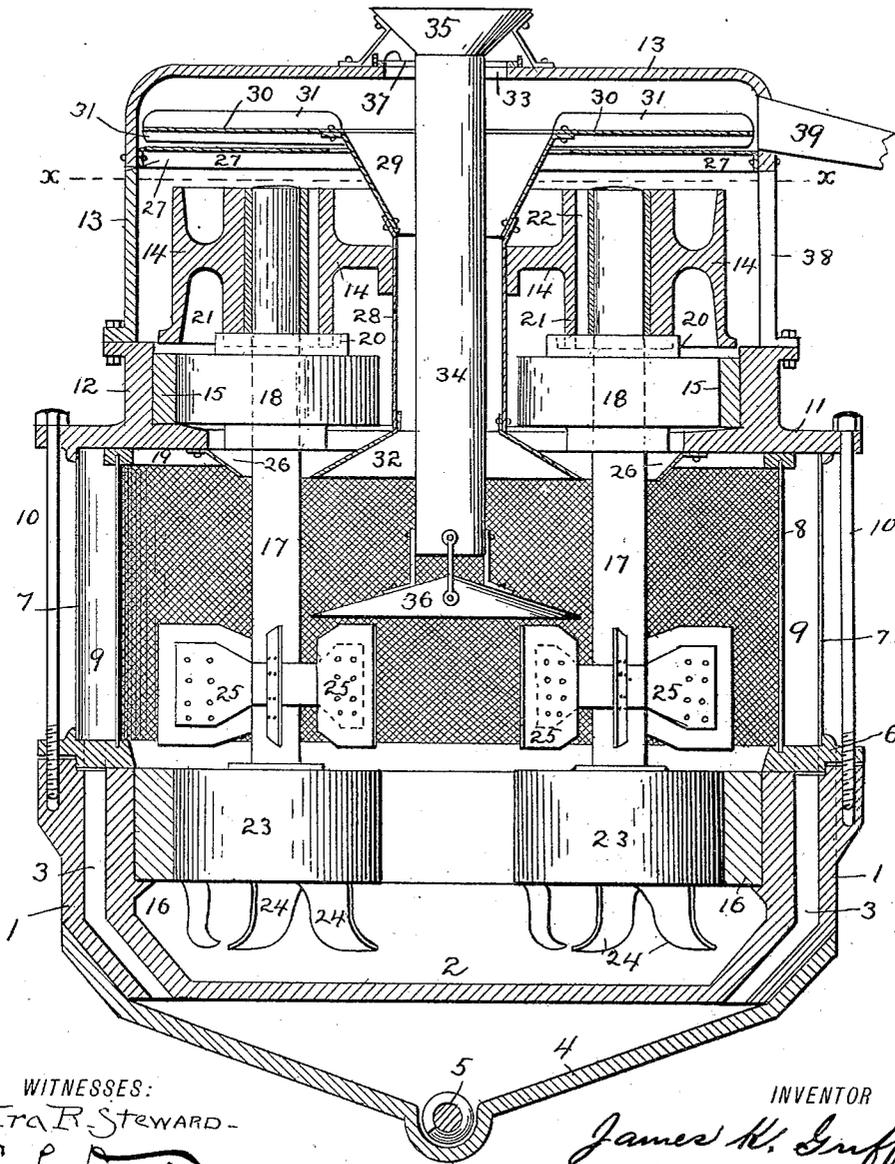
2 Sheets—Sheet 1.

J. K. GRIFFIN.
PULVERIZING MILL.

No. 452,782.

Patented May 26, 1891.

Fig. 1.



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Fig. 2.

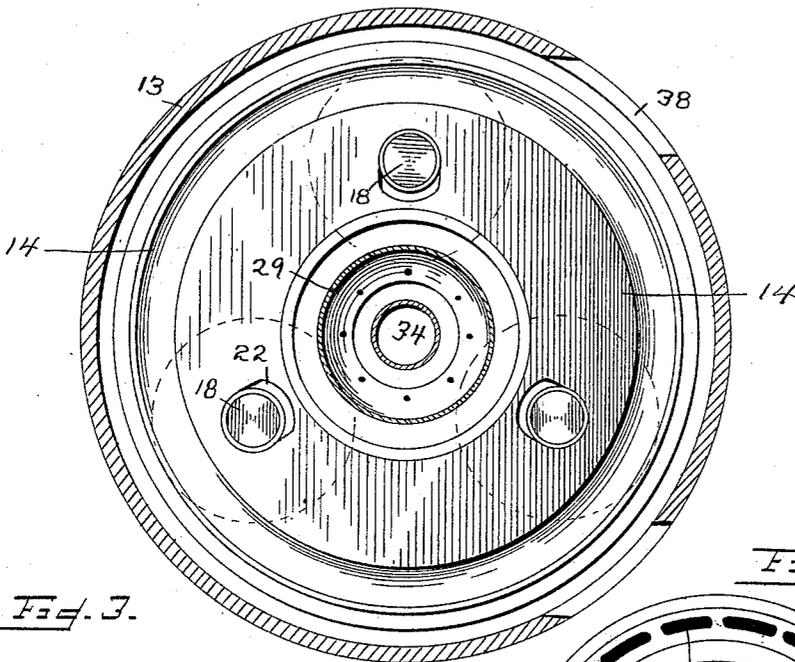


Fig. 3.

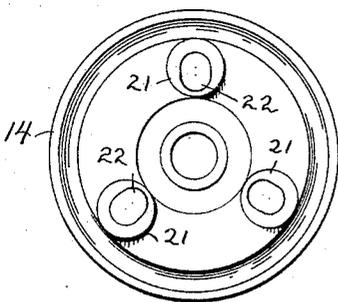
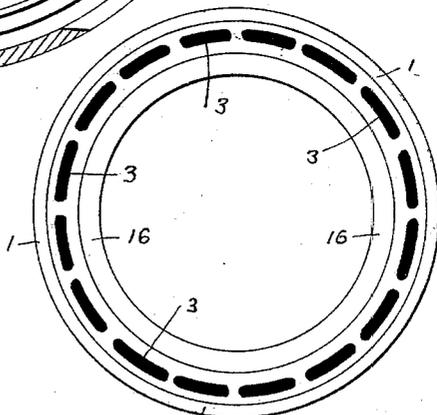


Fig. 4.



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JAMES KENT GRIFFIN, OF BROOKLYN, NEW YORK.

PULVERIZING-MILL.

SPECIFICATION forming part of Letters Patent No. 452,782, dated May 26, 1891.

Application filed October 20, 1890. Serial No. 368,726. (No model.)

To all whom it may concern:

Be it known that I, JAMES KENT GRIFFIN, a citizen of the Dominion of Canada, residing at the city of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Pulverizing-Mills; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The object of my invention is the production of a mill in which ores or other substances, however hard or refractory, may be cheaply and rapidly crushed and pulverized or reduced to powder; and the invention relates more particularly to that class of pulverizing-mills in which the reduction or pulverization of ores or other substances is accomplished by the revolution of one or more rolls within and against the inner surfaces of a ring or annular die; and it consists in the construction and arrangement or combination of parts disclosed in this specification, of which the accompanying drawings form a part, and in which similar numerals of reference designate like or equivalent parts wherever found throughout the several views.

In said drawings, Figure 1 represents a central vertical section of my improved mill, in which two grinding-rolls are employed, the rolls and other details of construction being shown in full lines. Fig. 2 represents a horizontal section on the line *x x* of Fig. 1, in which, however, provision is made for the use of three grinding-rolls; and Figs. 3 and 4 show details of construction.

Referring to the drawings, the numeral 1 designates the annular base of the mill, provided with a closed bottom 2 and openings or passages 3, arranged in a circle through the side walls of the base, as shown in Fig. 4, the purpose of which will be hereinafter explained.

Attached to or connected with the base 1, in any desired manner and below the same, is a hopper 4, provided with a screw-carrier 5, or other preferred means for removing the ground material which is deposited in the hopper, as hereinafter described.

Above the base 1 and resting on the same

is preferably placed an annular ring 6, provided with openings or passages corresponding with the passages 3 in the base, and supported upon this ring is the annular casing 7, and within this casing and resting upon the ring 6 is also placed an annular screen 8, of any preferred construction, in such a manner as to form an annular chamber 9 between the casing and screen and inclosing the grinding-chamber.

Resting upon the casing 7, and firmly secured thereto and to the base by means of bolts 10, is an annular cover and support 11, which is provided with an upwardly-extending flange or rim 12, and secured to this flange in any desired manner is a cover 13, which incloses the pulley 14 by which the grinding mechanism is driven.

Within the flange or rim 12 of the cover or support 11 is placed an annular die 15, and within the upper annular portion of the base is firmly secured an annular die 16.

Rigidly mounted on shafts 17 are carrier or driving rolls 18, which rest normally on an inwardly-extending portion 19 of the annular support 11. The rolls 18 are provided on their upper surfaces with annular projections 20, and within these projections hubs 21, formed upon the pulley 14, enter. The pulley 14 is loosely mounted on the shafts 17, which extend upward far enough to form journals for that purpose, and the journal-openings 22, formed in the pulley, are preferably slightly oblong in cross-section in the direction of the center of the pulley, the purpose of which will be hereinafter explained. The grinding-rolls 23 are also firmly secured to the shafts 17 and are in contact with the annular die 16, and these rolls are provided with plows or stirrers 24, of any desired shape or form, secured to the bottom thereof in any desired manner. Firmly attached to the roll-shafts 17 immediately above the rolls 23 are fans or vanes 25, which may be placed parallel with the shafts or at any angle thereto, according to the nature of the material to be acted upon or the result to be obtained. The upper surface of the inwardly-projecting portion 19 of the support 11, on which the rolls 18 rest, is preferably slightly downwardly inclined in order to avoid friction between it and the rolls

18, and secured on the under inner edge thereof is an annular deflector 26.

An annular diaphragm 27, having an opening in the center, is attached to the cover 13 and divides the space above the grinding-chamber into two compartments, the lower of which I designate as the "pulley" or "power" chamber and the upper as the "dust-chamber."

The pulley 14, a top plan view of which is shown in Fig. 2 and a bottom view in Fig. 3 on a reduced scale, is provided centrally with an opening, in which is firmly secured a pipe or tube 28, provided at its upper end with a funnel 29, to the upper end of which is secured an annular plate or disk 30, provided, preferably, on its upper and lower sides with radial fans or vanes 31. The lower end of the tube 28 is also provided with an inverted-funnel-shaped deflector 32, and it will at once be seen that all the parts attached to the pulley 14 revolve with it in the operation of the apparatus.

In the center of the top or cover 13 is an opening 33, and through this opening extends a pipe or tube 34, provided at its upper end with a hopper or funnel 35, and through this funnel and tube is supplied the material to be ground or pulverized. A conical-shaped deflector 36, connected with the lower end of the tube 34, serves to deflect the material entering the grinding-chamber through the tube 34 laterally and spread it so that it may be more readily operated upon by the grinding-rolls 23, and an annular space around the top of the tube 34 is provided with a register 37, by which the draft within the mill may be regulated. It will be seen that the grinding-rolls 23 and the carrying-rolls 18, being rigidly connected by the shafts 17, form what may be termed a "vertical truck," in which the rolls form the wheels and the dies the track, the traction of the trucks when the mill is in operation being centrifugal force instead of gravity. The power for operating the mill is preferably applied by means of a belt, which enters the top of the mill through an opening or openings 38 in the side thereof.

When the mill is not in operation, the weight of the truck and pulley is sustained by the upper rolls 18, resting on the inner portion 19 of the support 11; but in operation the weight is removed from this support, and the rolls are held in contact with the dies by centrifugal force. The upper rolls control the movement of the lower or grinding rolls, preventing them from slipping on the material to be ground. The oblong journal-boxes in the pulley 14 permit of a slight but sufficient radial movement of the grinding-rolls and shafts caused by the material between the grinding-rolls and die. I prefer to employ three of these grinding-rolls, for which provision is made in Fig. 2, but have shown but two in Fig. 1, for the purpose of convenience of illustration.

In operation the material is supplied through the hopper 35 and tube 34, and fall-

ing upon the conical deflector 36 is distributed around the grinding-chamber, where it is formed by the action of the grinding-rolls 23, stirrers 24, and fans 25 into an annular body or wall of material against the face of the screen and die, when it is crushed between the rolls and die until reduced to the required degree of fineness, when it passes through the screen into the annular chamber 9, and thence through the passages 3 into the hopper 4, from which it may be removed by the conveyer 5. This description of the operation of the device applies to either dry or wet material. In wet-grinding a sufficient amount of water is supplied with the material to carry off the pulverized product as fast as produced. When very fine dry-grinding is required, the pulverized product may be "floated" off by the air through the tube 28, entering the same through the deflector 32 and passing into the dust-chamber above the diaphragm 27, from which it is discharged by the plate or disk 30 through the spout or discharge-pipe 39, the disk being aided in this operation by the fans or vanes 31. In this process the degree of fineness to which the material may be reduced may be regulated by the speed of the mill or the introduction of air through the register 37, or by both. The deflector 26 assists in deflecting the material and retaining it in contact with the screen, and also to some extent prevents the pulverized material from passing into the pulley or power chamber, in which operation it is aided by the air which enters through the belt opening or openings 38. It is also evident that in dry-grinding I may either discharge through the screen into the hopper 4 or through the dust-chamber by the floating process described, or by both processes at the same time.

Many changes in the construction and operation of my improved mill may be made without departing from the scope of my invention. The annular ring 6 may be omitted and the casing 7 and screen 8 supported directly on the base 1. The fans or vanes 25 and the plows or stirrers 24 are not absolutely essential to the operation of the mill, though they materially aid in producing the best results, and many other alterations in the arrangement and adaptation of the various elements may be made without materially changing the essential features or the results produced.

Having fully described my invention, its construction, and operation, I claim, and desire to secure by Letters Patent, the following:

1. In a pulverizing-mill, the combination, with a base and casing forming a grinding-chamber having an annular die located therein, of a series of roll-shafts, each provided with a carrier and a grinding roll rigidly attached thereto, an annular die forming a track for the carrier-rolls, a support for the carrier-rolls when at rest, and a pulley loosely mounted on journals formed by prolongations

of the roll-shafts, whereby the carrier-rolls and grinding-rolls are carried around their respective dies and rotated at the same time, substantially as shown and described.

2. The combination, in a pulverizing-mill having a grinding-chamber with a pulley or power chamber above the same, of an annular die located within the grinding-chamber, a series of grinding-rolls rigidly mounted on roll-shafts, on which are also rigidly mounted carrying-rolls supported in the pulley or power chamber, and a pulley loosely mounted on journals formed by prolongations of the roll-shafts, substantially as shown and described.

3. The combination, with a pulverizing-mill having a grinding-chamber and an annular die located therein, and a pulley and power chamber having an annular die therein located above the grinding-chamber, of a series of roll-shafts, as 17, having grinding-rolls and carrier-rolls rigidly mounted thereon, the carrier-rolls being supported and adapted to revolve in contact with the die within the power-chamber, and a pulley loosely mounted on prolongations of the roll-shafts above the carrier-rolls and supported thereby, whereby the carrier-rolls and grinding-rolls are carried around their respective dies and revolved, substantially as shown and described.

4. In a mill, the combination, with the base 1, having the annular die 16, of the cover and support 11, provided with the annular die 15, the carrier-rolls and grinding-rolls mounted on shafts 17, and the pulley 14, mounted on prolongations of the shafts 17 above the carrier-rolls, substantially as shown and described.

5. The combination, in a pulverizing-mill, of a base provided with an annular die, a hopper below the base, a screen and casing mounted above the base and forming an annular chamber 9, in communication with the hopper by means of passages 3 in the annular wall of the base, the screen and base inclosing the grinding-chamber, a support 11 above the grinding-chamber, provided with an annular die 15, the roll-shafts 17, provided with carrying-rolls mounted thereon, and the pulley 14, mounted on prolongations of the roll-shafts above the carrier-rolls and supported thereby, substantially as shown and described.

6. In a mill, the combination, with the roll-shafts 17, of the pulley 14, mounted on journals formed by prolongations of the roll-shafts, the journal-boxes in the pulley being radially oblong in cross-section, substantially as shown and described.

7. In a pulverizing-mill having a grinding and a power chamber, each of which is provided with an annular die, the combination of grinding-rolls mounted on shafts 17 within the grinding-chamber, carrying-rolls mounted on said shafts within the power-chamber, a pulley mounted on prolongations of said shafts above the carrying-rolls, a tube, as 28,

mounted centrally in said pulley provided with a disk 30, and the annular diaphragm 27, substantially as shown and described.

8. In a pulverizing-mill provided with a grinding-chamber and grinding-rolls located therein, the combination, with said rolls, of roll-shafts on which the rolls are mounted, carrier-rolls also mounted on said shafts and supported above the grinding-chamber, a pulley mounted on said shafts and supported by said carrying-rolls, and a tube 28, arranged centrally of said pulley and secured thereto, provided at its lower end with a deflector 32 and at its upper end with a funnel 29 and a plate or disk 30, the plate or disk being provided with fans or vanes 31, substantially as shown and described.

9. The combination, in a pulverizing-mill having a grinding-chamber, a power-chamber, and a dust-chamber, of grinding-rolls located in the grinding-chamber, connected with power mechanism located in the power-chamber, and means for conducting the pulverized material from the grinding-chamber into the dust-chamber and discharging the same from the mill, substantially as shown and described.

10. A pulverizing-mill having a grinding-chamber, a power-chamber above the grinding-chamber, a dust-chamber above the power-chamber, and means for conducting the pulverized product from the grinding-chamber into the dust-chamber and discharging the same from the mill, substantially as shown and described.

11. In a mill, the combination, with a grinding-chamber, a power-chamber above the same, and a dust-chamber above the power-chamber, of a pulley, as 14, located in the power-chamber by which the grinding mechanism is operated, and a tube, as 28, mounted centrally in said pulley and secured thereto and provided at its bottom with a deflector 32 and at its top with a funnel 29 and a plate or disk 30, said plate or disk being located within the dust-chamber and provided with fans or vanes 31, whereby when the pulley 14 is revolved in the operation of the mill the pulverized product from the grinding-chamber is carried upward through the tube 28 and discharged from the mill by the disk 30, substantially as shown and described.

12. The combination, in a pulverizing-mill of the base, the screen and casing mounted thereon inclosing the grinding-chamber and forming the annular chamber 9, the hopper 4 in communication with said chamber 9, the annular die within the base, the grinding-rolls and roll-shafts on which said rolls are mounted, the carrier-rolls 18, mounted on said shafts above the grinding-chamber, the pulley 14, also mounted on said shafts above the carrier-rolls, the tube 28, provided with the plate or disk 30, having fans or vanes 31, and means for operating the pulley and grinding-rolls, whereby the pulverized product is discharged from the top of the mill or through

the screen surrounding the grinding-chamber and into the hopper below, substantially as shown and described.

13. In a mill, the combination of an annular die located in the grinding-chamber, an annular support, as 11, above the grinding-chamber, said support being provided with a die 15 and an inwardly-projecting portion 19, carrier-rolls rigidly mounted on roll-shafts and supported when at rest by the inwardly-projecting portion 19 of the support 11, grinding-rolls also mounted on said shafts within the grinding-chamber, and a pulley mounted on prolongations of said shafts above the carrier-rolls, substantially as shown and described.

14. In a pulverizing-mill, the combination of a series of roll-shafts having grinding and carrier rolls mounted thereon at or near the ends of such shafts, an annular die against which the grinding-rolls revolve, an annular die or track against which the carrier-rolls revolve, and means for revolving said rolls around said dies, substantially as shown and described.

15. In a pulverizing-mill, the combination of a series of roll-shafts having grinding-rolls at or near one end and carrier-rolls at or near the other end thereof, the same being rigidly secured thereto, an annular die against which the grinding-rolls revolve, an annular die or track against which the carrier-rolls revolve, and means for revolving said rolls around said dies, substantially as shown and described.

16. In a pulverizing-mill, the combination of a series of roll-shafts having grinding-rolls at or near one end and carrier-rolls at or near the other end thereof, the same being rigidly secured thereto, fans or vanes mounted on said shafts between said carrier and said

grinding rolls, an annular die against which the grinding-rolls revolve, an annular die or track against which the carrier-rolls revolve, and means for revolving said rolls around said dies, substantially as shown and described.

17. In a pulverizing-mill, the combination of a series of roll-shafts having grinding-rolls and carrier-rolls rigidly secured thereto at or near the ends thereof, an annular die against which the grinding-rolls revolve, an annular die or track against which the carrier-rolls revolve, and a pulley in which said roll-shafts are revolvably mounted, substantially as shown and described.

18. In a pulverizing-mill, the combination of a series of roll-shafts having grinding-rolls and carrier-rolls rigidly secured thereto at or near the ends thereof, an annular die against which the grinding-rolls revolve, an annular die or track against which the carrier-rolls revolve, and a pulley having journal-boxes oblong on the line of the radii thereof, mounted on journals formed by prolongations of the roll-shafts, substantially as shown and described.

19. A pulverizing-mill having a grinding-chamber, a power-chamber above the grinding-chamber, a dust-chamber above the power-chamber, an annular chamber surrounding the grinding-chamber and separated therefrom by a screen in communication with a hopper beneath the grinding-chamber, and means for operating the mill and discharging the pulverized product through the dust-chamber or through the annular chamber into the hopper, substantially as shown and described.

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Witnesses:

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