

No. 857,288.

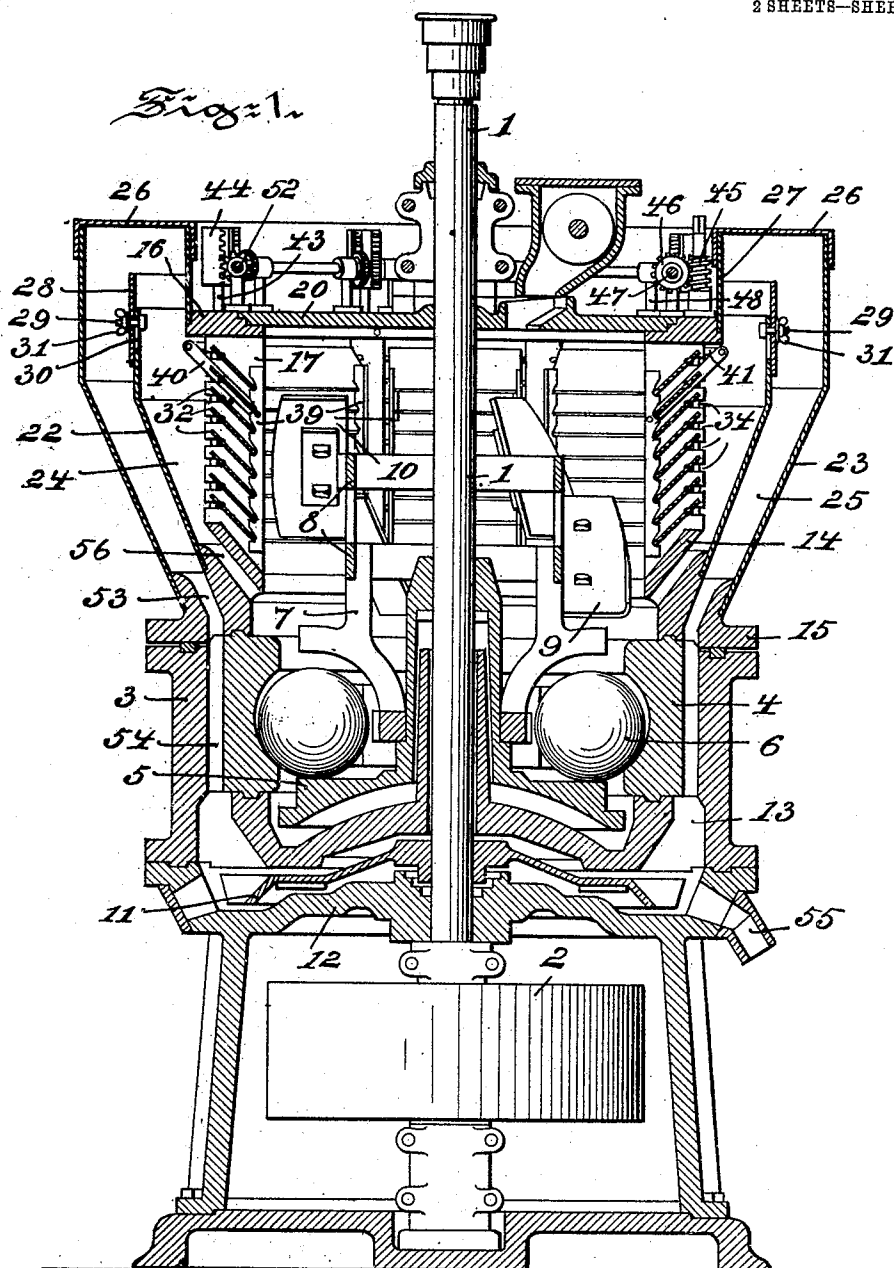
PATENTED JUNE 25, 1907.

J. W. FULLER, JR.

AIR SEPARATOR FOR PULVERIZING AND GRINDING MILLS.

APPLICATION FILED JULY 28, 1906.

2 SHEETS—SHEET 1.



WITNESSES:

Wilhelm Vogt
Thomas M. Smith

INVENTOR

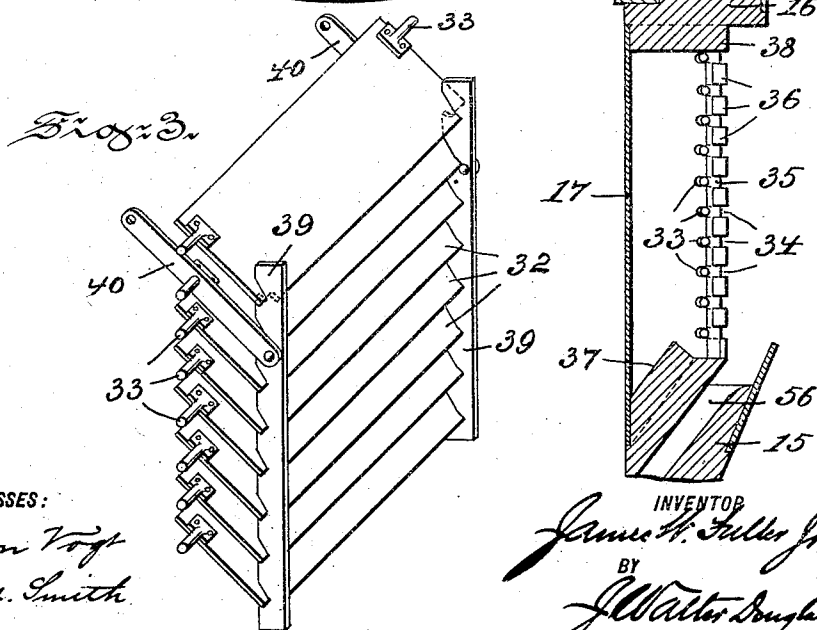
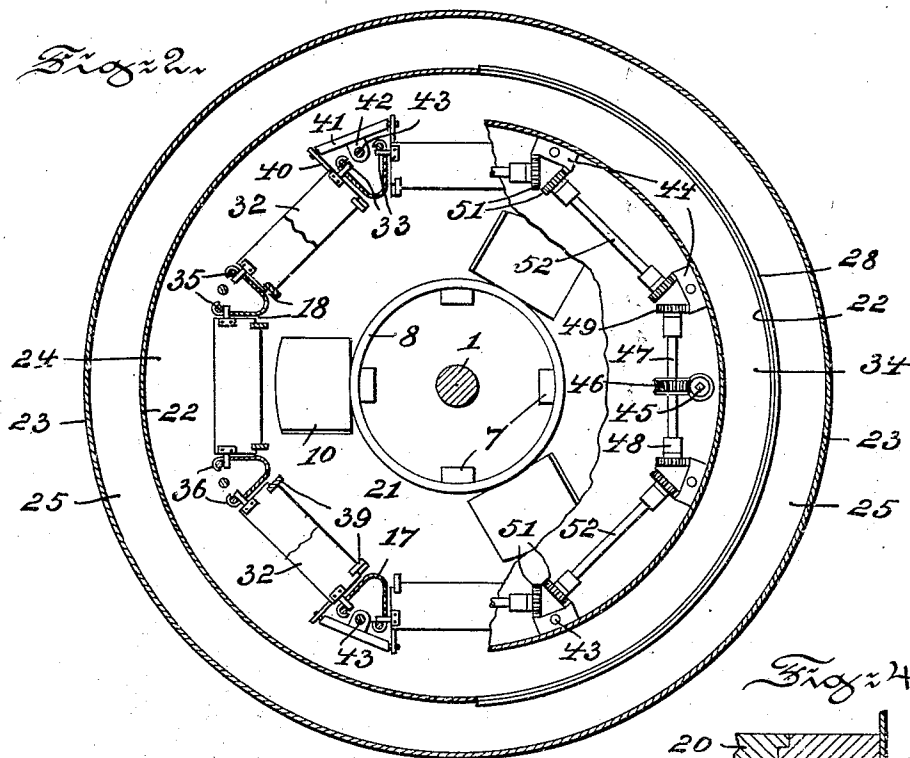
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UNITED STATES PATENT OFFICE

JAMES W. FULLER, JR., OF CATASAUQUA, PENNSYLVANIA.

AIR-SEPARATOR FOR PULVERIZING AND GRINDING MILLS.

No. 857,988.

Specification of Letters Patent.

Patented June 25, 1907.

Application filed July 28, 1906. Serial No. 328,232.

To all whom it may concern:

Be it known that I, JAMES W. FULLER, JR., a citizen of the United States, residing at Catasauqua, in the county of Lehigh and State of Pennsylvania, have invented certain new and useful Improvements in Air-Separators for Pulverizing and Grinding Mills, of which the following is a specification.

My invention has relation to an air-separator for pulverizing or grinding mills; and in such connection it relates more particularly to means for controlling the degree of fineness of ground matter discharged from the mill, the same embodying certain improvements in constructive arrangement of a mill of the type of the Hitzel U. S. Patent No. 778,452, of December 27th, 1904.

The principal objects of my present invention are first, to provide means for controlling the position of closing means for outlets connecting the suction chamber with the separating chamber of the mill; second, to provide means for increasing or decreasing the length of travel of matter from the separating chamber to the collecting chamber of the mill to aid the outlet closing means in determining the degree of fineness of matter discharged from the separating chamber; third, to provide the mill with means for forcing currents of air generated, in the mill, through the outlet spouts of the mill; fourth, to provide means for controlling outlet closing deflector slats from outside the mill and holding the same in a uniform position; and fifth, to so arrange the actuating means for the slats as to permit of ready removal of the same.

The nature and scope of my said invention will be more fully understood from the following description, taken in connection with the accompanying drawings forming part hereof, in which

Figure 1, is a view, illustrating partly in vertical central section and partly in elevation, a pulverizing or grinding mill, deflector slats or plates closing outlets of the mill for connecting the suction chamber with the separating and collecting chambers thereof, and means for controlling the angular positions of the slats from a given point at the top of the mill, all embodying main features of my said invention. Fig. 2, is a horizontal sectional view of the upper portion of the mill. Fig. 3, is a detail perspective view, enlarged, illustrating the slats closing one of the outlets disconnected from the mill and

certain of the means for controlling the angular position of the same; and Fig. 4, is a detail view, enlarged, illustrating partly in section and partly in elevation, a hollow post and means for removably connecting the slats therewith.

Referring to the drawings 1, represents the driven-shaft arranged vertically in the mill and 2, the driving-pulley therefor. Within the casing 3, traversed by the shaft 1, is arranged an annulus or grinding ring 4. To the shaft 1, is suitably secured a carrier 5, which supports grinding-balls 6, and a frame 7, which frame, by means of joined rings 8, supports two series of superposed wings or blades 9 and 10, arranged at different angular positions with respect to each other. In addition thereto, the shaft 1, also supports a platform 11, and sets the same, as well as the carrier 5, and by the intervention of the frame 7, and rings 8, also the wings or blades 9, and 10, in rotation, while the carrier 5, revolves the grinding balls 6, within the inner face of the grinding ring 4. The grinding ring 4, is supported by the casing 3, which in conjunction with the base 12, form the discharge-chamber 13, within which the platform 11, is arranged and rotated by the shaft 1. Upon the casing 3, is arranged a second casing 14, consisting of a base 15, and a ring 16, separated from each other, by hollow posts 17, which form openings 18, in the casing 14. The ring 16, serves to support a disk or cover-plate 20 and this disk or cover-plate in conjunction with the casing 14, forms a suction chamber 21, within which the wings or blades 9 and 10, are rotated. Outside the suction chamber 21, so formed the casing 14, is surrounded by casings 22 and 23, arranged concentrically with respect to each other, and supported by the base 15, of the casing 14. These casings 22 and 23, form a separating chamber 24, and collecting chamber 25. The collecting chamber 25, is closed at its upper end by a cap 26, forming a deflecting wall for air, which is supported by the casing 23, and a ring 27, carried by the ring 16, of the casing 14, while the separating chamber 24, communicates with the collecting chamber 23, at its upper end formed by a ring 28, which, by means of bolts 29, passing through slots 30, arranged in the casing 22, and thumb-nuts 31, is adjustably secured to the casing 22. By the raising and lowering of the ring 28, the separating chamber 24, may be increased or decreased in size. Within each of

the openings or outlets 18, connecting the suction chamber 21, with the separating chamber 24, are arranged a series of deflector or baffling plates or slats 32. Each of the slats 32, is provided with trunnions 33, passing through slots 34, arranged in the hollow post 17, and are engaged by rods 35, held in position by the inwardly curved ends 36, of the posts 17, and the trunnions 33, as will be readily understood from Fig. 2.

The hollow posts 17, are preferably formed, of sheet metal, bent to assume the shape shown in Fig. 2, and are connected to the ring 16, and base 15, of the casing forming the suction chamber 21, by bosses 37 and 38, formed integral therewith, as shown in Fig. 4. By lifting the ring 16, and plate 20, as well as the parts carried by the same from the mill, the rods 35, may be partially or completely withdrawn from the posts 17, after which a single one of the slats 32, or all the slats closing an outlet 18, of the suction chamber 21, may be removed therefrom for replacing or repairing the same by withdrawing the trunnions 33, from the slots 34, as will be readily understood from Figs. 2 and 4. The trunnions 33, being arranged at one edge of the slats 32, permit the same to drop at the other edge thereof, which is engaged by notched bars 39, held in engagement with the slats 32, by levers 40, secured to the trunnions 33, of one of the slats, as shown in Figs. 1 and 3. The levers 40, of two adjacent outlets 18, are connected with each other by a bar 41, having a boss or extension 42, to which is secured a rod 43, passing through the cover-ring 16, and carrying at its free end a rack-bar 44, as shown in Fig. 1. The number of rods 43, and rack-bars 44, will therefore correspond with the number of outlets 18, of the suction chamber 21, and in order to control the position of the slats 32, in each of the outlets 18, from one point, the following preferred mechanism is employed:—As shown in Figs. 1 and 2, to the cover-ring 16, is rotatably secured a worm-shaft 45, engaging a worm-gear 46, carried by a shaft 47, supported by brackets 48, connected with the ring 16. The shaft 47, at each end is provided with a gear-wheel 49, meshing with adjacent rack-bars 44. These adjacent bars 44, are connected with the remaining rack-bars 44, by means of gear-wheels 51, and shafts 52, so that the rotation imparted to the shaft 47, by the worm-shaft 45, and worm-gear 46, by means of the gear-wheels 51, and shafts 52, will be transmitted to all the rack-bars 44. The rack-bars 44, in turn raise or lower the rods 43, which by actuating the bars 41, and levers 40, raise and lower the free ends of the slats 32, through the intervention of the notched-bars 39, and shift and hold the same in various angular positions, for a purpose to be hereinafter more fully described. The angular positions of the slats 32, in-

crease or decrease the outlet opening 18, into the separating chamber 24, and furthermore, matter ground in the suction chamber 21, and discharged therefrom, through the outlets 18 will be directed by the slats 32, with more or less angularity against the casing 22.

When the wings or blades 9 and 10, are rotated in the suction chamber 21, the lower series of wings or blades 9, will elevate sufficient finely divided or ground matter from the grinding ring 4, and balls 6, as to throw the same into the path of the upper series of wings or blades 10. These wings or blades 10, assisted by the current of air generated in the suction chamber 21, by both series of wings, will throw the matter against the slats 32, from which the same will be deflected against the wall 22, of the separating chamber 24. Owing to the position of the slats 32, the matter will be thrown directly against the wall 22, without being deflected by the slats 32. By striking the wall 22, the finely divided or ground matter will be separated from the coarser matter in the chamber 24, and carried by the current of air generated in the suction chamber from the separating chamber 24, into the collecting chamber 25, thence through passageways 53, arranged in the base 15, of the casing 14, and passageways 54, arranged in the casing 3, into the discharge chamber 13, from which it will escape under pressure of the current of air through the spouts 55. The coarser matter which owing to the weight thereof has not been lifted into the collecting chamber 25, will descend into the separating chamber 24, by gravity and will then pass through passageways 56, back into the path of the grinding balls 6, and grinding face of the ring 4. The degree of fineness of matter discharged from the mill can be regulated by shifting the slats 32, into a position in which the same will raise the matter in its exit from the suction chamber 21, which matter by being deflected by the slats 32, will strike the wall 22, at a more or less elevated point. Thus less finely divided matter can be lifted into the collecting chamber 25, by the current of air. The degree of fineness of matter is further controlled by the ring 28, which owing to the position thereof, with respect to the wall 22, will increase or decrease, the height of the same. Thus the length of travel of matter in exit from the separating chamber 24, into the collecting chamber 25, is lessened or extended; and hence the ring 28, will assist the slats 32, in their control of the degree of fineness of matter discharged through the spout 55, of the mill.

Having thus described the nature and objects of my invention, what I claim as new and desire to secure by Letters Patent is:—

1. In a pulverizing or grinding mill, a casing having outlets, a series of slats movably arranged in said outlets, bars connecting said

slats with each other, levers connected with said bars, cross-bars for connecting the levers of two adjacent series of slats, rods carrying rack-bars connected with said cross-bars, a shaft consisting of a series of sections, each section having gear-wheels adapted to engage the rack-bars of said rods, said rack-bars adapted to couple two adjacent sections of said shaft and means for positively rotating one of said sections, said positively actuated section in conjunction with said rack-bars adapted to rotate the other sections of said shaft, substantially as and for the purposes described.

2. In a pulverizing or grinding mill, a casing having outlets, a series of slats movably arranged in said outlets, bars connecting said slats with each other, levers connected with said bars, cross-bars for connecting the levers of two adjacent series of slats, rods carrying rack-bars connected with said cross-bars, a shaft consisting of a series of sections,

each section having gear-wheels adapted to engage the rack-bars of said rods, said rack-bars adapted to couple two adjacent sections of said shaft, and means for positively rotating one of said sections, said positively actuated section in conjunction with said rack-bars adapted to rotate the other section of said shaft, said rack-bars in conjunction with said rods, when actuated, adapted to raise and lower said cross-bars and said cross-bars arranged to actuate said levers and the connecting bars of said slats, to shift and hold the same in each given position, substantially as described.

In witness whereof, I have hereunto set my signature in the presence of two subscribing witnesses.

JAMES W. FULLER, JR.

Witnesses:

GEORGE KOPP,
A. J. KOPP.