March 22, 1927. 1,621,571

H. E. WITZ

PULVERIZER

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Fig. 1.

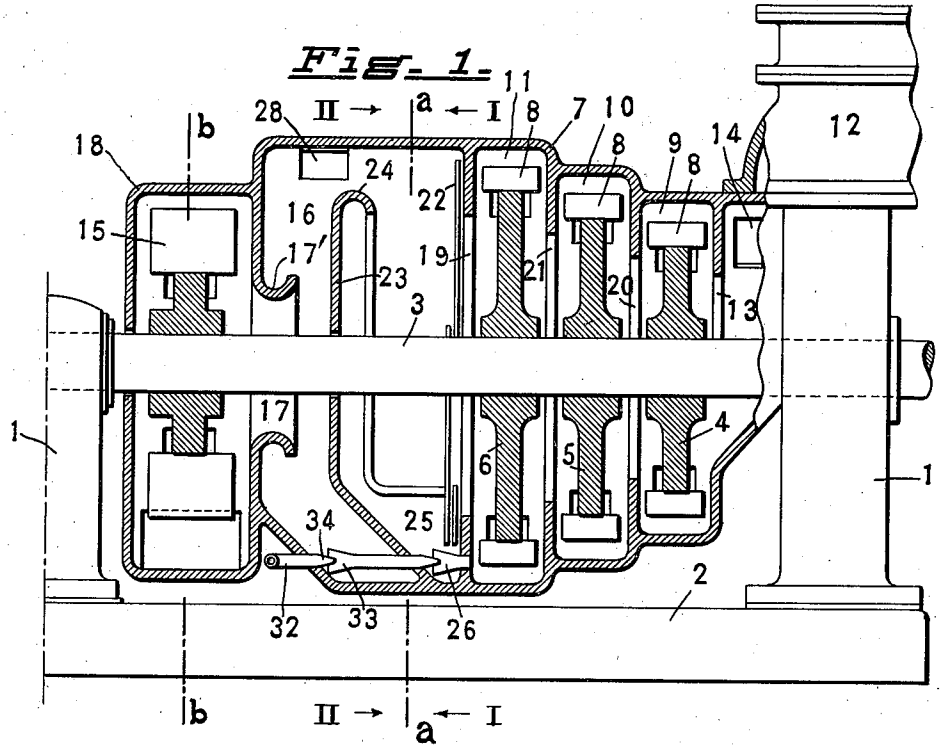
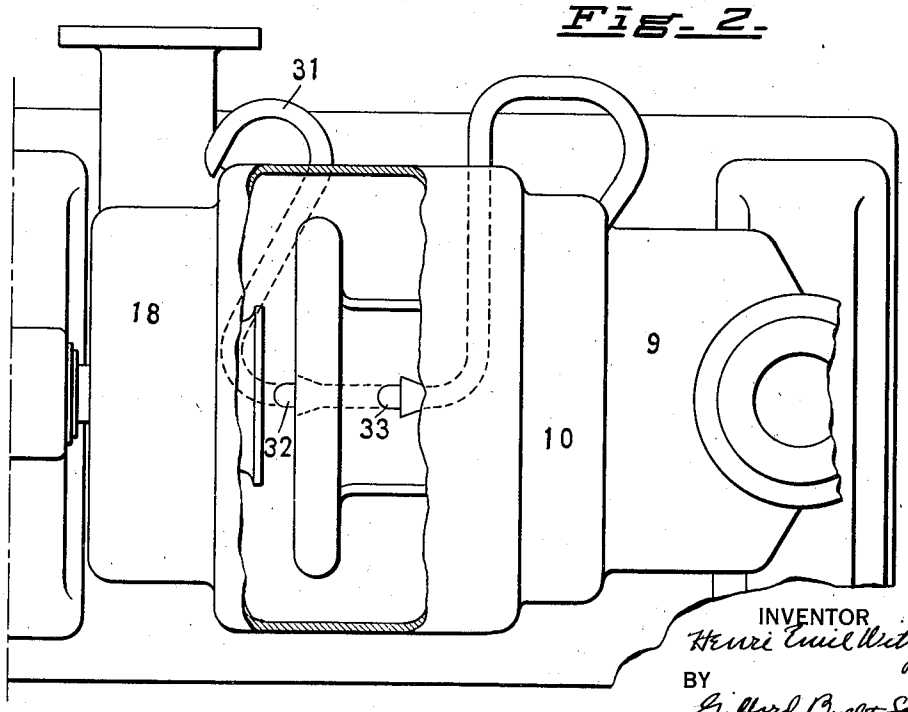


Fig. 2.



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Fig. 3.

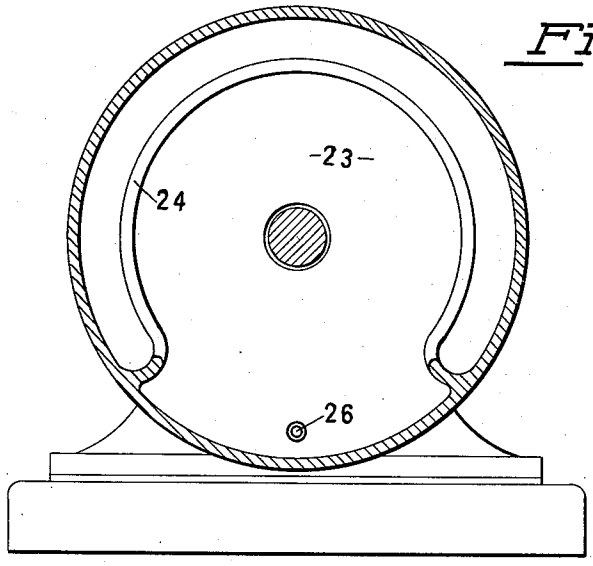


Fig. 5.

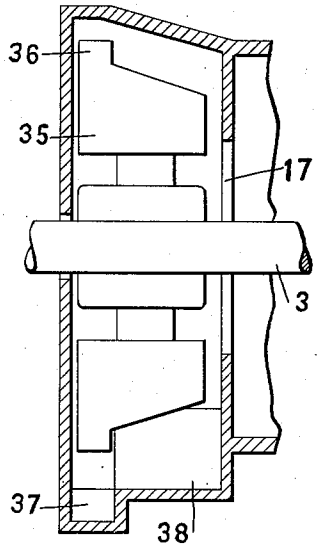
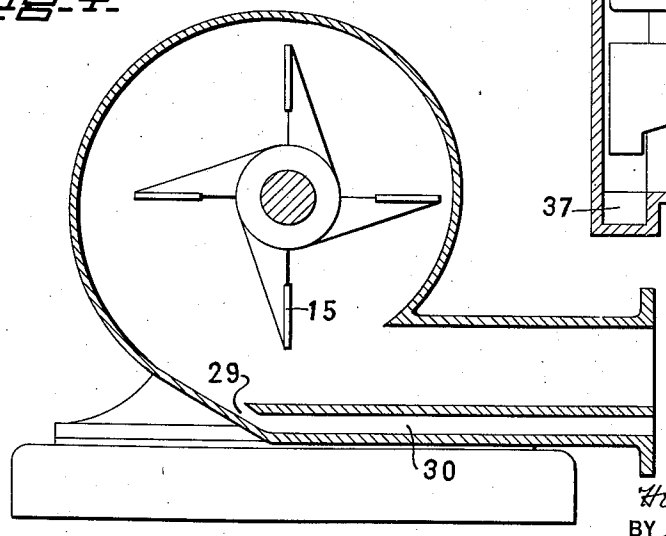


Fig. 4.



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Fig. 6.

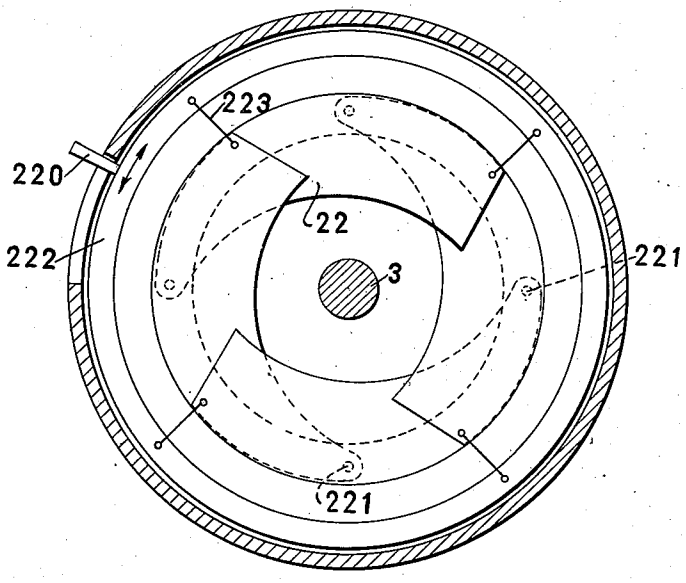
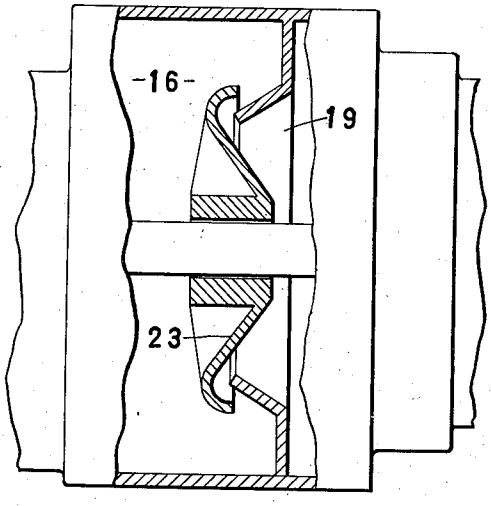


Fig. 7.



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UNITED STATES PATENT OFFICE.

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PULVERIZER.

Application filed May 25, 1923, Serial No. 641,290, and in Germany May 26, 1922.

The present invention relates to pulverizers for coal and similar substances and will be best understood from the following description and annexed drawings in which Fig. 1 is a vertical, longitudinal section; Fig. 2 is a view partly in section, and Fig. 3 is a section on the line *a*—*a* in Fig. 1, looking in the direction of the arrow I. Fig. 4 is a section on the line *b*—*b* in Fig. 1, while Fig. 5 illustrates a particular form of construction of the fan. Fig. 6 is a section on the line *a*—*a* in Fig. 1, looking in the direction of the arrow II and Fig. 7 illustrates means for regulating the opening between the last pulverizer and the sifting chamber.

Referring to the drawings, 3 is a shaft mounted in standards 1 in a machine bed 2, said shaft being suitably driven. On this shaft are arranged three discs 4, 5 and 6, which are enclosed by a casing 7. The discs carry on their periphery pulverizer scoops 8 and are enclosed in boxes 9, 10 and 11. The material is fed thru the chute in the usual manner and into the box 9 containing the disc 4, the material entering the box 9 through an opening 13 in the right hand wall. Below the feeding device 12 is provided a regulatable opening 14, for the admission of air. On the other end of the shaft is arranged a centrifugal fan runner 15, which is supported in a suitable casing 18. Between the centrifugal fan 15 and the box 11 is left a comparatively large chamber 16, communicating with the centrifugal fan by means of an opening 17 surrounded by an annular neck 17′, and communicating with the box 11 by means of an opening 19. The boxes 9, 10 and 11 communicate with one another by means of openings 20, and 21, of sizes gradually increasing towards the fan. The large opening 19 can be enlarged or reduced by the arrangement shown in Fig. 6. Here, the plates 22 are pivoted at 221 and are connected to the movable ring by means of links 223. Movement of ring 223 by means of handle 220 will rotate the plates 22 about their respective pivots thereby altering the size of the opening. Opposite the opening 19 and within the chamber 16 is arranged a baffle disc 23 with overturned edge 24 and leading to a recess 25. Through a regulatable opening 28 outside air can be led into the box 16 at will. On the periphery of the fan casing is provided a slit 29 leading to a duct 30 which is connected to a pipe 31 leading to a nozzle 32 arranged in the bottom portion of the left-hand side of the chamber 16. This nozzle terminates in a pipe 33, providing an annular space 34 between the nozzle 32 and its own outside edge. Pipe 33 extends into the recess 25 in the form of a nozzle and terminates in a pipe 26 affording an annular space between itself and the nozzle. The pipe 26 terminates in the box 11 (Fig. 1) or in the box 10 (Fig. 2). at an acute angle to the direction of movement of the pulverizers of the corresponding disintegrator discs 6 or 5.

The modus operandi is as follows:

Coal is fed by the feeding device 12 in known manner and falls into the box 9. Air, is admitted to the box through the opening 14. In consequence of the rotation of the shaft 3 the fan will tend to draw the air entering opening 14 through the whole system and force it out through the fan discharge outlet. The coal passing into the box 9 is pulverized by the pulverizer scoops 8 and the coal dust is forced into the box 10 by the draft of air through the opening 20. The cross-sectional area of the opening 20 determines the velocity of the air and, consequently, the size of the small pieces of fuel carried by the draft. In the box 10 further pulverizing takes place and as the opening 21 has a larger cross-sectional area than the opening 20, only more finely-pulverized dust can be drawn therethrough, due to the air velocity being smaller than that through opening 20. This dust then passes into the box 11 and is still further pulverized therein.

Due to the comparatively large opening 19 still finer dust is separated out, while the larger grained dust remains behind and is still further pulverized.

With uniform furnace working the consumption of pulverized coal will also be uniform and the fineness of the fuel will normally suffice and will also be uniform. If, however, in order to increase the duty of the furnace, more pulverized fuel becomes necessary, the opening 14 must be opened further so that more air can pass through the system. As a result the velocities through the individual openings 20, 21 and 19 become greater, and larger-grained pieces of fuel

would then pass into the furnace, and as they cannot be burnt they would impair the efficiency of the furnace. In order, therefore, to keep the velocity within the system as uniform as possible, the cross-sectional area of the opening 19 is controlled by the shutters 22, so that the increased quantity of air, due to the increased cross-sectional area, can only pass through this opening at a correspondingly smaller velocity and, consequently, cannot take with it fuel which is too large-grained. Any large-grained pieces which may be removed will, owing to their weight, be thrown against the baffle surfaces 23 and cannot be carried around it and escape with the current of air. They fall into the recess 25. The amount of supplementary air as well as the suction action exerted on the pulverizer systems can be regulated by means of the opening 28. The air carrying the coal dust and flowing around the baffle plate 23 is then drawn towards the opening 17 by means of the fan, and can, by the formation of the neck 17', be freed from excessively large particles of pulverized fuel. The mixture of dust and air is given a centrifugal motion in the fan and forced through the discharge outlet into the furnace. The larger-sized particles of pulverized fuel, owing to their weight, will move along the periphery of the fan casing and into the duct 30. Owing to the pressure produced by the fan the coarse particles are forced, together with air, through the duct 30 into the pipe 31, and to the nozzle 32. The current of air produced will draw the material, which is on the left hand side of the chamber 16, with it through the annular opening 34; in the same way the material in the recess 25 will be forced back through the nozzle 26 into one of the boxes 11 or 10, where it is again subjected to the operation of the pulverizer. In order to produce better pressure action in the pipe 31, as well as better sifting of the pulverized coal, it is preferable to construct the fan in the manner shown in Fig. 5. The fan casing is of conical form, increasing with the distance from the opening 17. The blades 35 themselves may also be cut to correspond with the conical form of the fan casing, and at their widest part may be provided with extensions 36, which thereby to some extent form an additional fan of increased radius, which consequently also exercise a greater pressure action. The mixture of air and dust entering through the opening 17 is given a centrifugal motion by the fan blades 35. The heavier pieces of pulverized fuel, which move along the periphery of the casing, will, owing to the conical form of the fan casing, move towards the widened part thereof and are then forced through a separate duct 37, together with air, into the pipe 31, and thence back into the pulverizer. The dust which is sufficiently fine, cannot pass to the lower edge so quickly and is forced through the main opening 38 into the furnace.

In the construction shown in Fig. 7, the baffle wall 23 is adjustable and can be used at the same time for regulating the opening 19. The larger-grained particles of fuel impinging on the baffle plates are thrown behind the neck bounding the opening 19 and are removed therefrom in any desired manner.

The forced draft for drawing off the large-grained particles separated out in the chamber 16 and for returning them into the pulverizers can, of course, also be produced by a separate fan.

I claim:

1. A pulverizing mill comprising a pulverizer proper, a fan, a casing therefor, he suction side thereof communicating with said pulverizer for propelling material therethrough, means for separating out the larger particles of the material in said casing, an expansion chamber between said fan and said pulverizer, means for adding the particles separated out in said chamber to those from the fan casing and means for returning all the said particles to the pulverizer.

2. A pulverizing mill comprising a pulverizer proper, a fan, a casing therefor, the suction side thereof communicating with said pulverizer for propelling material therethrough, means for separating out the larger particles of the material in said casing, an expansion chamber between said fan and said pulverizer, means utilizing a portion of the current of air produced by the fan for adding the particles separated out in said chamber to those from the fan casing and means for returning all the said particles to the pulverizer.

3. A pulverizing mill comprising a pulverizer proper, a fan, a casing for said fan, the suction side thereof communicating with said pulverizer for moving material therethrough, said fan and casing being of substantially conical form with the small diameter of the cone adjacent the pulverizer proper to facilitate the separation of the heavier particles, and a duct leading from the casing adjacent its end of large diameter for conveying away said particles.

4. A pulverizing mill comprising a casing, an annular partition dividing said casing into a pulverizing chamber and an expansion chamber, pulverizing units in series in said pulverizing chamber, means for admitting material to be pulverized thereto, means for creating current of air through said chambers in the direction of said expansion chamber, the latter being of a size to effect a substantial diminution in the

velocity of the stream of material passing therethrough, whereby the larger particles in said stream are deposited.

5. A pulverizing mill comprising a casing, an annular partition dividing said casing into a pulverizing chamber and an expansion chamber, pulverizing units in series in said pulverizing chamber, means for admitting material to be pulverzed thereto, means for creating current of air through said chambers in the direction of said expansion chamber, the latter being of a size to effect a substantial diminution in the velocity of the stream of material passing therethrough, whereby the larger particles in said stream are deposited, and means for varying the effective opening in said annular partition.

6. A pulverizing mill comprising a casing, an annular partition dividing said casing into a pulverizing chamber and an expansion chamber, pulverizing units in series in said pulverizing chamber, means for admitting material to be pulverized thereto, means for creating current of air through said chambers in the direction of said expansion chamber, the latter being of a size to effect a substantial diminution in the velocity of the stream of material passing therethrough, whereby the larger particles in said stream are deposited, and baffle means in said chamber for further separating out the larger particles in said stream.

7. A pulverizing mill comprising a casing, an annular partition dividing said casing into a pulverizing chamber and an expansion chamber, pulverizing units in series in said pulverizing chamber, means for admitting material to be pulverized thereto, means for creating current of air through said chambers in the direction of said expansion chamber, the latter being of a size to effect a substantial diminution in the velocity of the stream of material passing therethrough, whereby the larger particles in said stream are deposited, and baffle means in said chamber for further separating out the larger particles in said stream, said chamber having a flared exit opening.

8. A pulverizing mill comprising a casing, an annular partition dividing said casing into a pulverizing chamber and an expansion chamber, pulverizing units in series in said pulverizing chamber, means for admitting material to be pulverized thereto, means for creating a current of air through said chambers in the direction of said expansion chamber, the latter being of a size to effect a substantial diminution in the velocity of the stream of material passing therethrough, whereby the larger particles in said stream are deposited, and a supplementary air inlet to said expansion chamber.

9. A pulverizing mill comprising a casing, an annular partition dividing said casing into a pulverizing chamber and an expansion chamber, pulverizing units in series in said pulverizing chamber, means for admitting material to be pulverized thereto, means for creating a current of air through said chambers in the direction of said expansion chamber, the latter being of a size to effect a substantial diminution in the velocity of the stream of material passing therethrough, whereby the larger particles in said stream are deposited, and means for returning the particles separated out in the expansion chamber to said pulverizing chamber.

10. A pulverizing mill comprising a casing, an annular partition dividing said casing into a pulverizing chamber and an expansion chamber, pulverizing units in series in said pulverizing chamber, means for admitting material to be pulverized thereto, means for creating a current of air through said chamber in the direction of said expansion chamber, the latter being of a size to effect a substantial diminution in the velocity of the stream of material passing therethrough, whereby the larger particles in said stream are deposited, and means utilizing a portion of the current of air produced by the fan for returning the particles separated out in the expansion chamber to said pulverizing chamber.

11. A pulverizer proper, a fan, a casing therefor, the suction side thereof communicating with said pulverizer for propelling material therethrough, the blades of said fan being provided with a diametrically extended portion to facilitate the separation of the heavier particles and a duct opposite the path of said extended portion.

12. A pulverizing mill comprising a pulverizer proper, a fan, a casing for said fan, the suction side thereof communicating with the said pulverizer for moving material therethrough, said fan and casing being of substantially conical form with the small diameter of the cone adjacent the pulverizer proper to facilitate the separation of the heavier particles, said fan being formed with blades having a diametrically extended portion, a duct leading from the fan casing opposite the path of said extended portion, and another duct leading from the fan casing for conveying away the material therefrom.

13. A pulverizing mill comprising a casing of substantially circular cross section and containing pulverizer units in series with their centers axially aligned, an expansion chamber and a fan for drawing the material undergoing pulverization through said casing.

14. A pulverizing mill comprising a casing of substantially circular cross section and containing pulverizer units in series

with their centers axially aligned, an expansion chamber and a fan for drawing the material undergoing pulverization through said casing, and a substantially circular baffle in said expansion chamber, and means between said baffle and said pulverizer units for withdrawing particles separated out by said baffle.

15. A pulverizing mill comprising a casing of substantially circular cross section and containing in substantially concentric relationship an annular partition dividing said casing into a pulverizing chamber and an expansion chamber pulverizing units in said pulverizing chamber, a substantially circular baffle in said expansion chamber, said partition being provided with an opening into said pulverizing chamber for material separated out by said baffle, means for returning said material through said opening to said pulverizing chamber, said mill having means for propelling material therethrough in the direction of said expansion chamber.

16. A pulverizing mill comprising a casing of substantially circular cross-section and containing pulverizer units in series with their centers axially aligned, an expansion chamber, a fan for drawing the material undergoing pulverization through the casing, a substantially circular baffle in said expansion chamber, and means for withdrawing from the chamber particles deposited on the wall thereof on both sides of said baffle.

17. A pulverizing mill comprising a casing of substantially circular cross-section and containing in substantially axial alignment a pulverizing chamber, an expansion chamber within the casing, an annular partition separating the said chambers, and a plurality of pulverizing units in said pulverizing chamber, a substantially circular baffle in said expansion chamber, a fan, a casing for the fan communicating with the pulverizing chamber and the expansion chamber, the fan being arranged to draw material through said chambers, means for adding the heavier particles separated out in the fan casing to those separated out in the expansion chamber on both sides of the said baffle, and means for returning all the said particles to the pulverizing chamber.

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