

May 29, 1923.

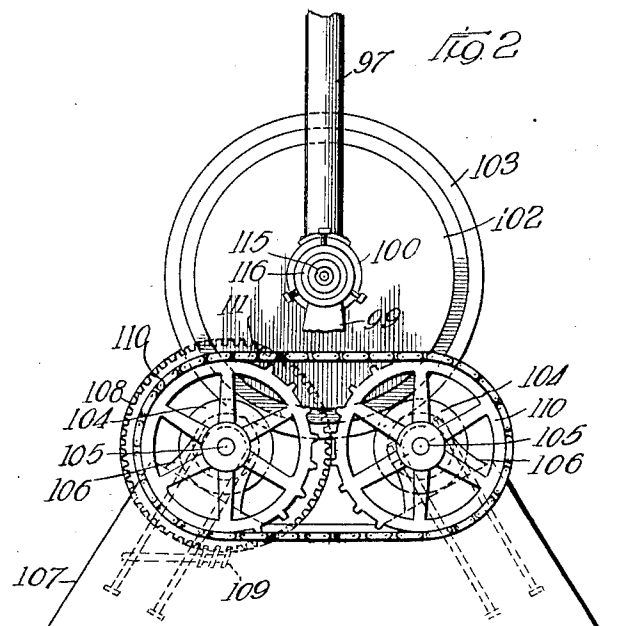
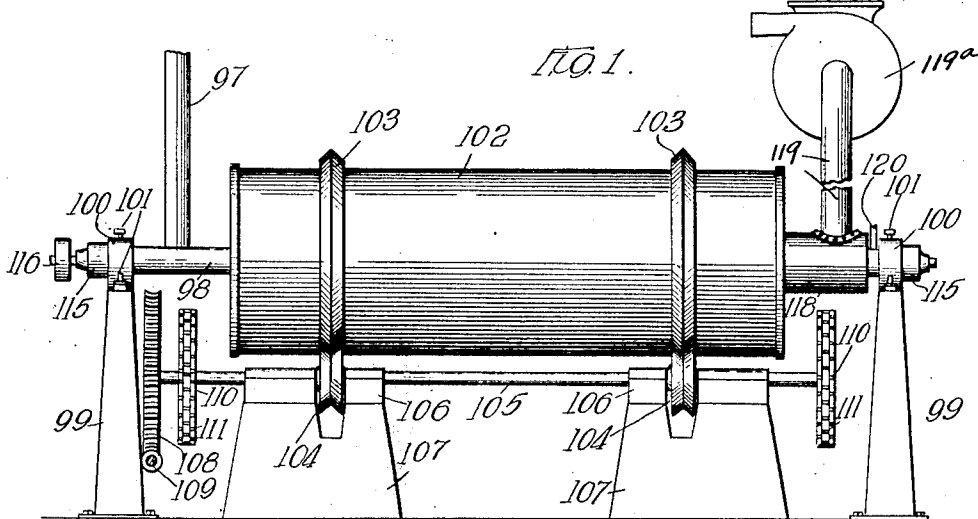
1,457,084

W. L. McLAUGHLIN

PULVERIZING APPARATUS

Filed Jan. 20, 1919

4 Sheets-Sheet 1



Witnesses:

Harry R. L. White

W. P. Hilroy

Inventor

Wilson L. McLaughlin

By Barnett Truman
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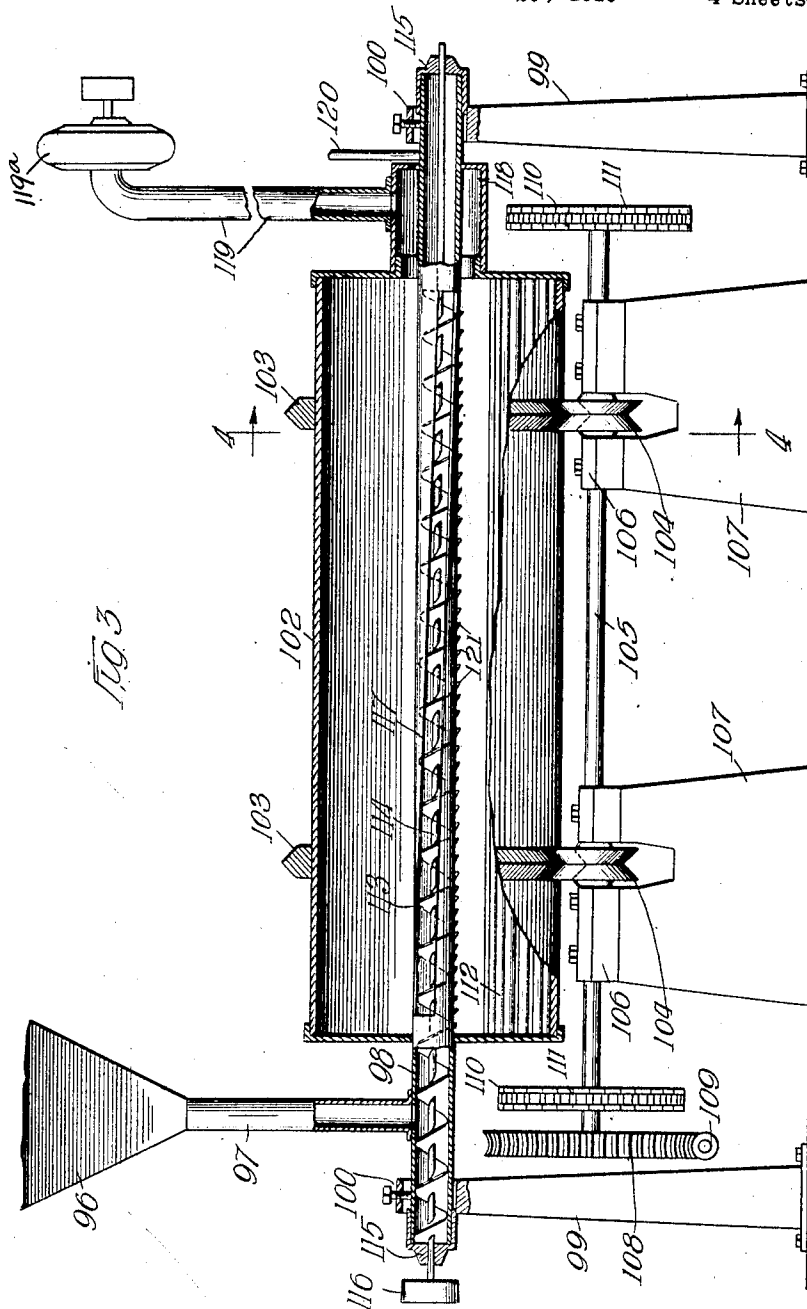
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4 Sheets-Sheet 2



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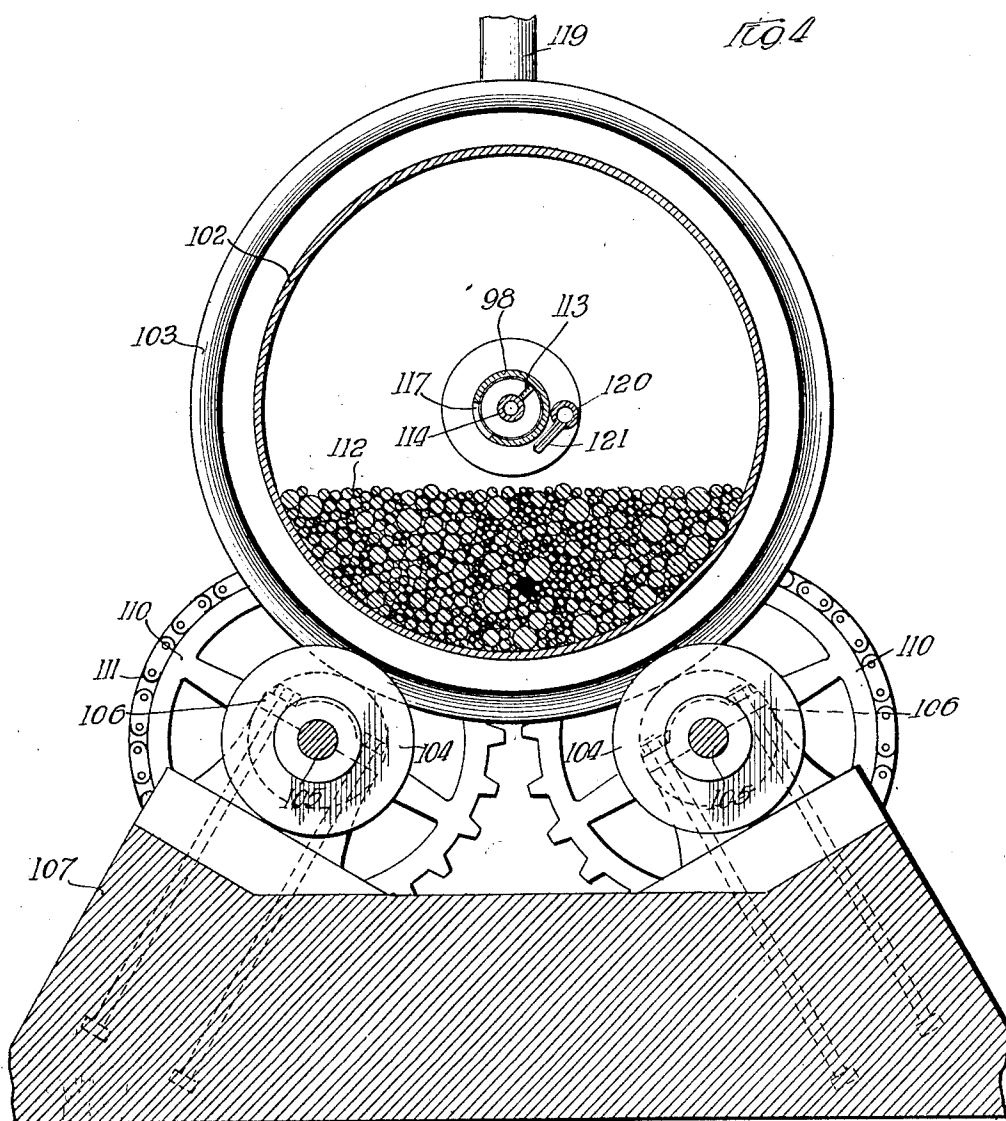
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4 Sheets-Sheet 3



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FIG. 5.

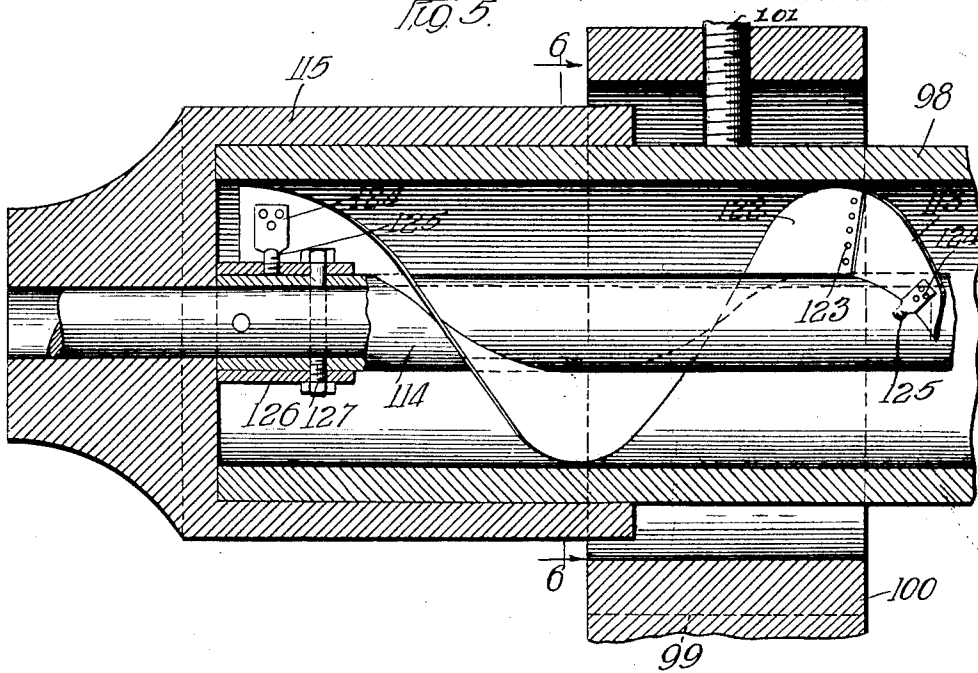


FIG. 6.

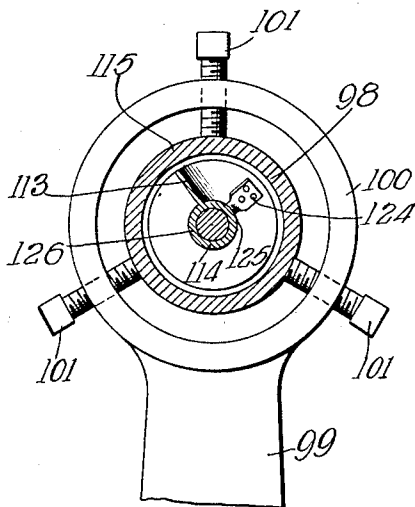
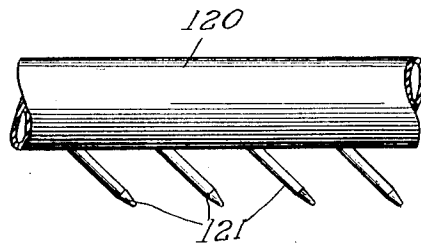


FIG. 7.



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UNITED STATES PATENT OFFICE.

WILSON L. McLAUGHLIN, OF DECATUR, ILLINOIS.

PULVERIZING APPARATUS.

Original application filed September 25, 1918, Serial No. 255,618. Divided and this application filed January 20, 1919. Serial No. 272,073.

To all whom it may concern:

Be it known that I, WILSON L. McLAUGHLIN, a citizen of the United States, residing at Decatur, in the county of Macon and State of Illinois, have invented certain new and useful Improvements in Pulverizing Apparatus, of which the following is a specification.

My invention relates to pulverizers and particularly to a novel pulverizing apparatus especially adapted for use in reducing fuel, such as coal, to an impalpable powder.

This invention was first disclosed in my co-pending application, Serial No. 255,618, filed Sept. 25, 1918, of which this application is a division.

The construction herein disclosed, while particularly adapted for use in pulverizing fuel, may be employed for other purposes and the apparatus is intended to be covered by the claims included herein without regard to the use to which it is put. Its advantages will be fully pointed out herein-after.

The invention will be more fully understood by reference to the accompanying drawings, wherein,

Fig. 1 is a side elevation of a pulverizer constructed in accordance with my invention;

Fig. 2 is an elevation of the left end of the device as viewed in Fig. 1, certain parts being broken away;

Fig. 3 is a longitudinal vertical sectional view of the device;

Fig. 4 is a transverse sectional view taken on the line 4—4 of Fig. 3;

Fig. 5 is a fragmentary longitudinal sectional view of the distributing conveyor;

Fig. 6 is a transverse sectional view on the line 6—6 of Fig. 5, and,

Fig. 7 is an enlarged detail view showing the arrangement of the air blast nozzles which I prefer to employ.

The material to be treated is supplied to a hopper 96, (best shown in Fig. 3) from which it passes through the conduit 97, to the cylindrical casing 98, mounted at opposite ends on standards 99. The standards terminate in circular bosses 100 through which are threaded set screws 101 (Fig. 6) for centering the casing 98. The casing extends through a cylindrical drum 102 having peripheral bearing rings 103 by means of

which it is revolubly supported on two pairs of rollers 104 (the rollers being preferably formed with V-shaped grooves and the bearing rings having a corresponding configuration) which rollers are fixed to shafts 105 carried in bearing boxes 106 supported upon and connected with a suitable foundation 107. One of the shafts 105 has fixed thereto a worm gear 108 driven by a worm 109. The shafts 105 are provided at both ends with sprocket wheels 110 for link belts 111, the purpose of having two pairs of sprockets and two chains being to distribute the power transmitted from one shaft to the other by driving the latter from the former at both ends.

Within the drum 102 are arranged a plurality of free rolling crushing elements consisting of cylindrical rollers 112 which extend the length of the drum and are of a multiplicity of different diameters. The purpose of having the rollers of different diameters is to insure a rubbing or slipping of one roller on the other so as to increase the abrasive action of the rollers on the material treated and to minimize the voids between the rollers; the principal object of the invention being to provide a pulverizer which will divide coal or other like material into extremely fine particles, in fact which will crush it and grind it to an impalpable powder.

Arranged within the casing 98 is a screw conveyor 113, the shaft 114 of which extends through the caps 115, which close the opposite ends of the casing, the shaft being provided at one end with a driving pulley 116. In order to distribute the material evenly lengthwise of the drum, the casing 98 is formed with a spiral slot 117, the high point of which is at the end of the casing into which the material is delivered and the low point near the other end of the casing. At the discharge end of the drum is arranged a housing 118 from which leads a pipe 119 to the suction fan 119^a. In order that only the finest particles should be withdrawn from the pulverizer, I employ a weak suction (fan 119^a being operated accordingly) and agitate the material in the drum by small air jets so that a separation by gravity will take place which will leave in suspension in the air only those particles light enough to be withdrawn by the suction.

The jets shown are incapable of discharging the material from the drum. They merely impinge upon the material on the rollers and put the finest particles in suspension. To this end compressed air is introduced into the drum through a pipe 120, this pipe being provided with a plurality of air nozzles 121, which are directed downwardly toward the bottom of the drum and obliquely toward the discharge end thereof. The jets of air issuing from these nozzles cause the finest of the particles of the ground material to be suspended in the air. The heavier particles fall back upon the rollers 112. Only those particles which are extremely fine will be light enough to be acted upon by the suction. These finest particles which in the case of coal are hardly coarser than smoke or soot particles are drawn through pipe 119 and fan 119^a and are separated from the air in a suitable dust collector (not shown).

Figs. 5 and 6 indicate a construction of the conveyor 113 which is preferred because economical. The flight of the conveyor is made in sections, each section 122 consisting of a ring of metal which is cut on a radial line and bent to spiral form as shown. The sections are overlapped slightly and riveted together, as indicated at 123. They are secured to the flattened ends 124 of studs 125 which are threaded into annular members 126 fastened by bolts 127 to the shaft 114 of the conveyor.

By employing pulverizing elements in the form of rods of different diameters and arranging the rods in longitudinal relation to the cylinder I am able to produce an impalpable powder at a relatively rapid rate. The substance as it is withdrawn from the cylinder is so minutely subdivided that substantially 50% thereof will pass through a screen having two hundred meshes per lineal inch and 20% thereof will pass a screen of three hundred meshes per lineal inch. Thus it will be seen that the highest pulverizing efficiency is secured.

I claim:

1. A pulverizer comprising in combination a cylindrical horizontally supported drum the length of which is considerably greater than its diameter and a plurality of cylindrical smooth faced pulverizing rollers therein, of substantially the same length as the interior of the drum, and all of which are without connection one with the other so as to be free to roll and tumble over each other when the drum is revolved, and of a multiplicity of different diameters so that the interstices between those of larger diameter are as nearly filled as practicable by those of smaller diameter, and so that a rubbing action on the material treated is produced by the rolling movement of said rollers, the rollers forming a compact mass filling the

bottom portion of the drum with the voids between the rollers reduced to a minimum.

2. A pulverizer comprising a revoluble drum having a plurality of pulverizing elements in the bottom thereof which are rolled on each other by revolution of the drum to subject the material confined in the drum to continual treatment until it has been pulverized, means for introducing compressed air into said drum in a plurality of agitating jets extending the length of the drum and directed against the material operated on to separate the finest particles from those less finely pulverized and to suspend only the finest particles in the air in the drum, and independent means for producing a weak suction directly and longitudinally throughout the upper part of the drum just strong enough to withdraw from the drum only the finest particles thus suspended without carrying off the material undergoing pulverization.

3. A pulverizer comprising a horizontally disposed revoluble drum, a plurality of cylindrical pulverizing elements in the drum, of substantially the same length as the interior thereof and free to roll and tumble over each other, means for introducing material into the drum and feeding the same between and longitudinally of said cylindrical pulverizing elements in substantially uniform quantity throughout the length of the drum, means for directing compressed air against the material being pulverized in substantially uniform quantity throughout the length of the drum to separate the finest of the particles from those less finely pulverized and put said finest particles in suspension in the air in said drum, and independent means for producing a weak suction just strong enough to withdraw from the drum the finest particles thus suspended without carrying off the material undergoing pulverization.

4. A pulverizer comprising a horizontally disposed revoluble drum, means for pulverizing the material extending throughout the length of the drum, means for introducing material into the drum and feeding to the pulverizing means in substantially uniform quantity throughout the length of the drum, means for directing compressed air against the material being pulverized in substantially uniform quantity throughout the length of the drum to separate the finest of the particles from those less finely pulverized and put said finest particles in suspension in the air, and independent means for producing a weak suction just strong enough to withdraw from the drum the finest particles thus suspended without carrying off the material undergoing pulverization.

5. A pulverizer comprising a horizontally disposed revoluble drum, a plurality of cy-

lindrical pulverizing elements in the drum of substantially the same length as the interior of the drum, and free to roll and tumble over each other, means for introducing material into the drum and feeding the same between and longitudinally of said cylindrical pulverizing elements in uniform quantity throughout the length of the drum, means for directing compressed air against the material being pulverized in a plurality of jets arranged throughout the length of the drum to separate the finest of the particles from those less finely pulverized and put said finest particles in suspension in the air, and independent means for producing a weak suction just strong enough to withdraw from the drum the finest particles thus suspended without carrying off the material undergoing pulverization.

6. In a pulverizer the combination of a horizontally supported, revoluble drum, a plurality of cylindrical rollers in said drum of several different diameters, of substantially the same length as the interior of the drum, and free to roll and tumble over each other, a distributing casing extending through said drum lengthwise of the same and formed with a spiral discharge slot in the side the inclination of which is downward from the inlet end of the casing, means for conveying material through said casing so that it will feed out of said slot in substantially uniform quantities throughout the length of the drum, means for exhausting the air from one end of the drum, and a compressed air pipe extending through the drum lengthwise thereof having nozzles directed downwardly and toward the end of the drum from which the air is exhausted.

7. In a pulverizer the combination of a horizontally supported revoluble drum, a plurality of cylindrical pulverizing elements therein substantially as long as the interior of the drum and free to roll and tumble over each other, and means for introducing material into the drum and feeding the same between and longitudinally of the pulverizing elements in substantially uniform quantities throughout the length of the drum.

8. In a pulverizer the combination of a horizontally supported revoluble drum, a plurality of cylindrical pulverizing elements therein substantially as long as the interior of the drum and free to roll and tumble over each other, means for introducing material into the drum and feeding the same between and longitudinally of the pulverizing elements in substantially uniform quantities throughout the length of the drum, means for introducing compressed air into the drum and directing it in substantially uniform amounts throughout the length of the drum to put the finest particles in suspension in the air, and means for exhausting air

from one end of the drum to produce a weak suction which will be just strong enough to carry off the finest particles so put into suspension without affecting the material undergoing pulverization.

9. In a pulverizer the combination of a horizontally supported cylindrical revoluble drum, a plurality of cylindrical rollers of several different diameters in the drum substantially as long as the interior of the drum and free to roll and tumble over each other, a distributing casing extending through the drum at its axis of rotation and formed with a spiral discharge slot in the side the inclination of which is downward from the inward end of the casing, a conveyor in said casing for moving the material therethrough and feeding the same out of said slot in substantially uniform quantities throughout the length of the drum, a compressed air pipe extending into and lengthwise of the drum provided with a discharge nozzle directed toward the bottom of the drum, a stationary housing communicating with said drum at one end, and means for exhausting the air from the drum having a conduit connected with said housing.

10. In a pulverizer the combination of a horizontally supported revoluble drum, a plurality of pulverizing elements therein, an axially arranged distributing casing extending through the drum from end to end and having a discharge slot in the side which is downwardly inclined in the direction away from the inlet end of the casing, and a conveyor in said casing to feed the material therethrough and discharge the same through said slot in quantities which are substantially uniform throughout the length of the drum.

11. A pulverizer comprising in combination a pulverizing chamber having therein pulverizing means which operates uniformly on the material throughout the length of the chamber, means for feeding the material to be treated to said pulverizing means in quantities which are substantially uniform throughout the length of the chamber, means operating substantially uniformly throughout the length of the drum for separating the finest of the particles from those less finely pulverized and suspending said finest particles in the air, and means for withdrawing the particles in suspension in the air from said chamber.

12. A pulverizer comprising a revoluble drum having a plurality of pulverizing elements in the bottom thereof which are rolled on each other by the revolution of the drum to subject the material confined in the drum to continual treatment until it is pulverized, said drum being formed with a discharge opening at one end thereof, means extending the length of the drum for directing air under pressure

against the pulverizing elements to cause the finer ground particles to be suspended in the air above the pulverizing elements, and means independent of said last-mentioned means for producing a free movement of the air and suspended particles longitudinally of the drum and directly throughout the space in said drum above the pulverizing elements and out through the discharge opening, serving to carry out of the drum the suspended fine particles without disturbing the coarser material being pulverized. 10

WILSON L. McLAUGHLIN.