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2,573,129

TWO-STAGE ROTARY PULVERIZER

Filed March 2, 1949

2 SHEETS—SHEET 1

Fig.1.

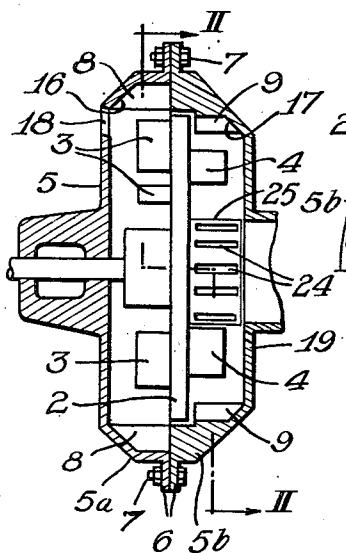


Fig. 2.

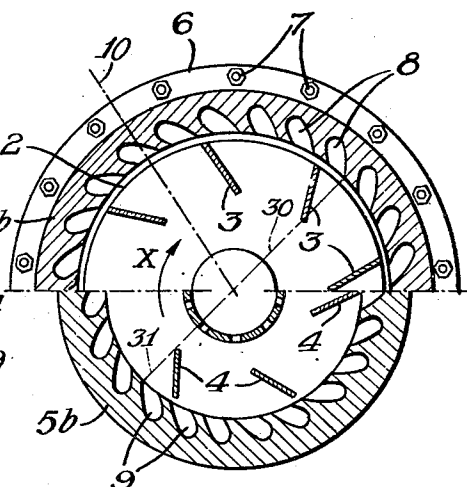


Fig. 3.

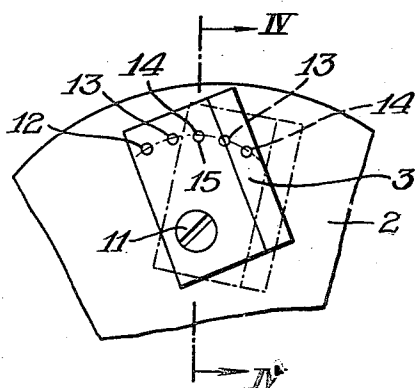
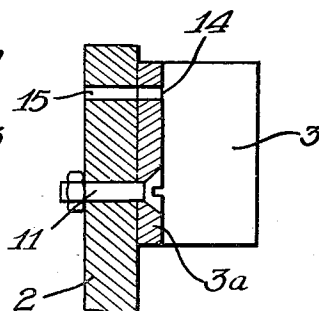


Fig. 4.



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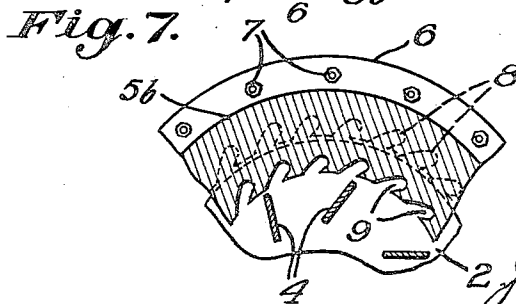
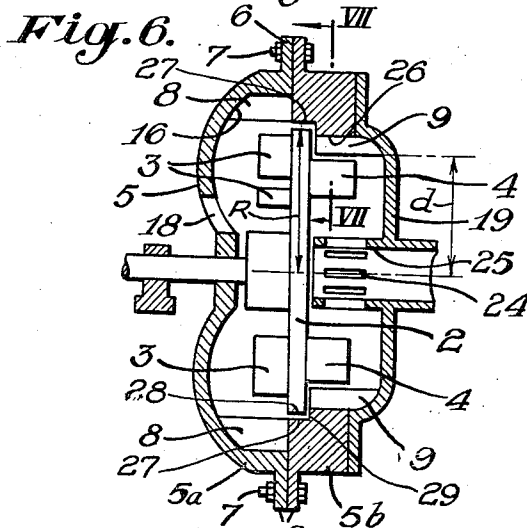
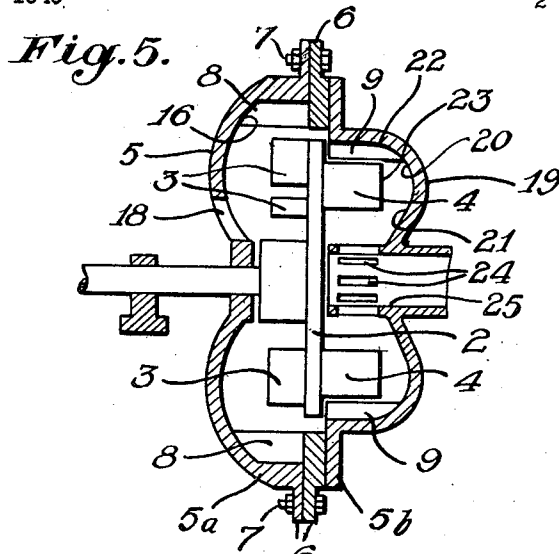
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2 SHEETS--SHEET 2



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UNITED STATES PATENT OFFICE

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TWO-STAGE ROTARY PULVERIZER

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6 Claims. (Cl. 241—154)

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This invention relates to crushers of the kind comprising a rotor provided with beaters rotating within a stator having at its inner periphery one or more rings of chambers opening towards the rotor. It has for its object to provide novel arrangement of the chambers, of the rotary beaters and/or of the stator, with a view to increasing the fineness of the product and the output of the crushing operation, as will be described hereinafter.

According to one feature of the invention, instead of being inclined forwardly with respect to a longitudinal plane passing through the middle of their inlet openings, the chambers are inclined rearwardly, this being favorable to fine crushing.

According to another feature, in order to vary easily, according to circumstances the amount of air circulating through the apparatus with the material to be crushed, the beaters are mounted on the rotor so that their angle to a longitudinal plane may be varied.

In crushers of this kind, it is known to make the peripheral chambers of such size that they extend parallel to the rotor axis beyond the region swept by the beaters. According to a feature of this invention, in order to increase the proportion of fines for a given input and in a given time, the portion of the chambers which extends axially beyond the beaters has an end surface which nears the axis as it swerves from the region of the beaters, and merges into the bottom surface of the other portion of the chambers, at a point in a diametral plane passing through the ends of the beaters.

It is also known to provide in such crushers a plurality of rings of chambers at the periphery of the stator, the number of beaters being the same in each ring of chambers. In order to improve the stability of delivery, a feature of this invention consists in providing for a ring of chambers situated behind another ring of chambers in the direction from inlet to outlet a smaller number of beaters than for said other ring of chambers. It is also possible to make the beaters for the rear ring of smaller size than the beaters of the front ring.

According to a further feature of the invention, the beaters and the walls of the peripheral chambers are made of hard material with a rough, preferably abrasive surface. This has the surprising result that not only does the apparatus then have a better resistance to wear, but its efficacy as regards the fineness and uniformity of crushing is greatly enhanced.

Further advantageous features of this inven-

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tion relates to the shape of the stator and the relative dimensions of the rotor disc and the chambers in front and behind such disc as will be explained hereinafter.

In the accompanying drawings which illustrate diagrammatically, by way of example, three embodiments of a crusher according to this invention:

Fig. 1 is an axial section showing one embodiment.

Fig. 2 is a cross-section on the broken line II—II, of Fig. 1.

Fig. 3 shows on a larger scale the adjustable mounting of a beater on the rotor disc.

Fig. 4 is a section on line IV—IV of Fig. 3.

Fig. 5 is an axial section showing another embodiment.

Fig. 6 is an axial section showing a further embodiment.

Fig. 7 is a partial cross-section on line VII—VII of Fig. 6.

The crusher illustrated in Figs. 1 to 4 has a rotor revolving in the direction of arrow X and comprising a disc fitted with two rings of beaters 3, 4, one on each side thereof. The rotor revolves in a stator 5 formed of two parts 5a, 5b provided with peripheral flanges 6 secured together by bolts 7. At its inner periphery the stator 5 is provided with two rings of chambers 8, 9, which chambers are inclined rearwardly with respect to a longitudinal plane such as 10 passing through the middle of their width at their inlet.

The beaters 3 and 4 are mounted on the disc so that their angle to a longitudinal plane may be easily varied. To this end, the beaters may be mounted as illustrated in Figs. 3 and 4, each beater being shaped as an angle iron having one wing secured to the disc 2 by a bolt 11. In the wing 3a are provided a number of holes 12, 13, 14, at equal distances from the bolt 11, so that any of these holes can be engaged by a pin secured to the disc 2. In Figs. 3 and 4, the pin 15 is engaged in the hole 14 and the beater is inclined rearwardly with respect to the direction of rotation shown by the arrow X. If the pin 15 were engaged in hole 12, the beater would be secured in the position shown in dot and dash lines in Fig. 3, and would be inclined forwardly. In practice, there may be a larger number of holes and these may be provided in the disc and the pin on the beater. The pin 15 may also be used as a pivot and the bolt 11 engaged in one of a series of holes provided in the beater or in the disc.

As is shown in Fig. 1, the chambers 8 and 9

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extend parallel to the rotor axis beyond the region in which the beaters rotate. The portion of the chambers 8 extending parallel to the axis beyond the beaters 3 has an end surface 16 which nears the rotor axis as it swerves from the region of the beaters. In a diametral plane passing through the ends of the bottom, this surface 16 merges into the bottom surface of the portion of the chambers which is within the region of the beaters. A similar end surface 17 is provided in the portion of chambers 9 which extends beyond the region in which the beaters 4 rotate.

The material to be crushed is fed into the crusher through an inlet opening 18 facing one side of the disc 2. It is evacuated through outlet openings 24 formed in a cylindrical member 25 connected with the outlet on the other side of said disc. Thus the material is first beaten by the front beaters 3 and then by the rear beaters 4. As shown in Fig. 2, the number of rear beaters 4 is smaller than the number of front beaters 3. Independently of the number of beaters, the rear beaters 4 may be made of smaller size than the front beaters 3. In both cases, the pressure at the rear of the rotor disc will be lower than the pressure in front of said disc, whereby the current of air and crushed material from the front to the rear of the apparatus will be accelerated.

It will further be seen from Fig. 2 that the rear beaters 4 are more inclined rearwardly than the front beaters 3. In other words the beaters 4 are inclined rearwardly relatively to the beaters 3. This may also take place when all the beaters are not inclined rearwardly. The relative inclination of beaters 3 and 4 can be seen from Figure 2, having radial lines 30 and 31 extending from the front or inner end of a beater 3 and of a beater 4 respectively to the center of the rotor. These lines show that the angle included between the radius and beater 3 is somewhat smaller than the angle included between the radius and beater 4.

The beaters 3 and 4, and the walls of the chambers 8 and 9, preferably consist of a hard material with a rough surface. They are advantageously made of an abrasive material such as cut flint embedded in a hard binder or in cast metal.

It is also possible to make the beaters and the chambers of cast iron having a Brinell hardness over 400, and a rough surface.

In the crusher illustrated in Fig. 5, the inner side of the rear wall 19 of the casing is concave. In axial section, this side is limited by an arc of a circle 20 and a straight line 21 at an angle of at least 60° to the rotor axis. The arc 20 extends tangentially to the end surface of the chambers 9 at a point 22 situated in a diametral plane passing through the terminal edges 23 of the beaters 4.

In the constructional embodiment shown in Figs. 6 and 7, the distance d between the rotor axis and the bottom 26 of the rear chambers 9 is smaller than the radius of the inner cylindrical surface 27 of the stator, in front of which extend the front chambers 8. Moreover the radius R of the rotor disc 2 is greater than the distance d .

The material leaving the front chambers along a helical path between the periphery 28 of the rotor disc 2 is thus constrained to move towards the rotor axis at 29 before it reaches the chambers 9. It is thus led towards the region in which the beaters 4 revolve and it is thrown with greater

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strength towards the walls of the chambers 9, whereby its comminution is furthered.

It will be understood that the invention is not limited to the details of the forms shown by way of examples and that various modifications can be made in the form, in the arrangement and in the construction of the elements described, without however departing from the scope of the appended claims.

I claim:

1. In a crusher the combination of a stator provided at its inner periphery with two rings of chambers opening inwardly, and with a circular concavity between said rings of chambers, said circular concavity having a cylindrical surface and a right angle intersecting annular surface, one of said rings of chambers being located radially outward and the other radially inward of said circular concavity, a rotor disc in said stator, said rotor disc facing said cylindrical surface of said concavity, the diameter of said rotor disc being comprised between the smaller and larger diameters of said right angle intersecting annular surface of said concavity, and a set of beaters on each side of said rotor disc, each said set of beaters facing one of said rings of chambers.

2. In a crusher, the combination of a stator, a ring of chambers in said stator on the inlet side thereof, a ring of chambers in said stator on the outlet side thereof, a circular concavity in said stator between said rings of chambers, said circular concavity having a cylindrical surface and a right angle intersecting annular surface, the ring of chambers on the inlet side of the stator being located radially outward and the ring of chambers on the outlet side of the stator being located radially inward of said circular concavity, a rotor disc journaled in said stator, said rotor disc having a diameter which is larger than the smaller diameter of said right angle intersecting annular surface, and facing said cylindrical surface and said right angle intersecting annular surface of said circular concavity, thereby forming with said surfaces of said concavity a path which extends, from the inlet to the outlet side of the stator, first parallel with respect to the rotor axis and then radially towards the rotor axis, said rings of chambers opening inwardly towards the rotor, a set of beaters on each side of said rotor disc, each set of beaters facing one of said rings of chambers, said chambers extending axially beyond the region swept by said beaters.

3. In a crusher as claimed in claim 2, each said chamber extending beyond the free ends of said beaters and having a bottom surface, the outer end of said bottom surface approaching the rotor axis as it swerves from the region swept by said beaters, the outer end of the bottom surface of each chamber on the outlet side of the stator merging into the bottom surface of the corresponding chamber at a point in a diametrical plane passing through the outer ends of said beaters.

4. In a crusher as claimed in claim 2, the distance between the rotor axis and the bottom of the chambers near the outlet side being smaller than the radius of the inner surface of the stator adjacent the chambers near the inlet side.

5. In a crusher as claimed in claim 2, the radius of said rotor disc being larger than the distance between the rotor axis and the bottom of the chambers near the outlet side.

6. In a crusher as claimed in claim 2, each said

chamber extending beyond the free ends of said beaters and having a bottom surface the outer end of which approaches the rotor axis as it swerves from the region swept by said beaters, the outer end of the bottom surface of each chamber on the outlet side of the stator merging into the bottom surface of the corresponding chamber at a point in a diametrical plane passing through the outer ends of said beaters, a side wall on the outlet side of the stator, said side wall having a central outlet, said side wall having inwardly, in axial section, the shape of a circular arc merging, on the one hand, into the outer end of the bottom surface of each chamber on the outlet side of the stator and on the other hand into a straight line which is inclined to the rotor axis at an angle of at least 60° and less than 90°.

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