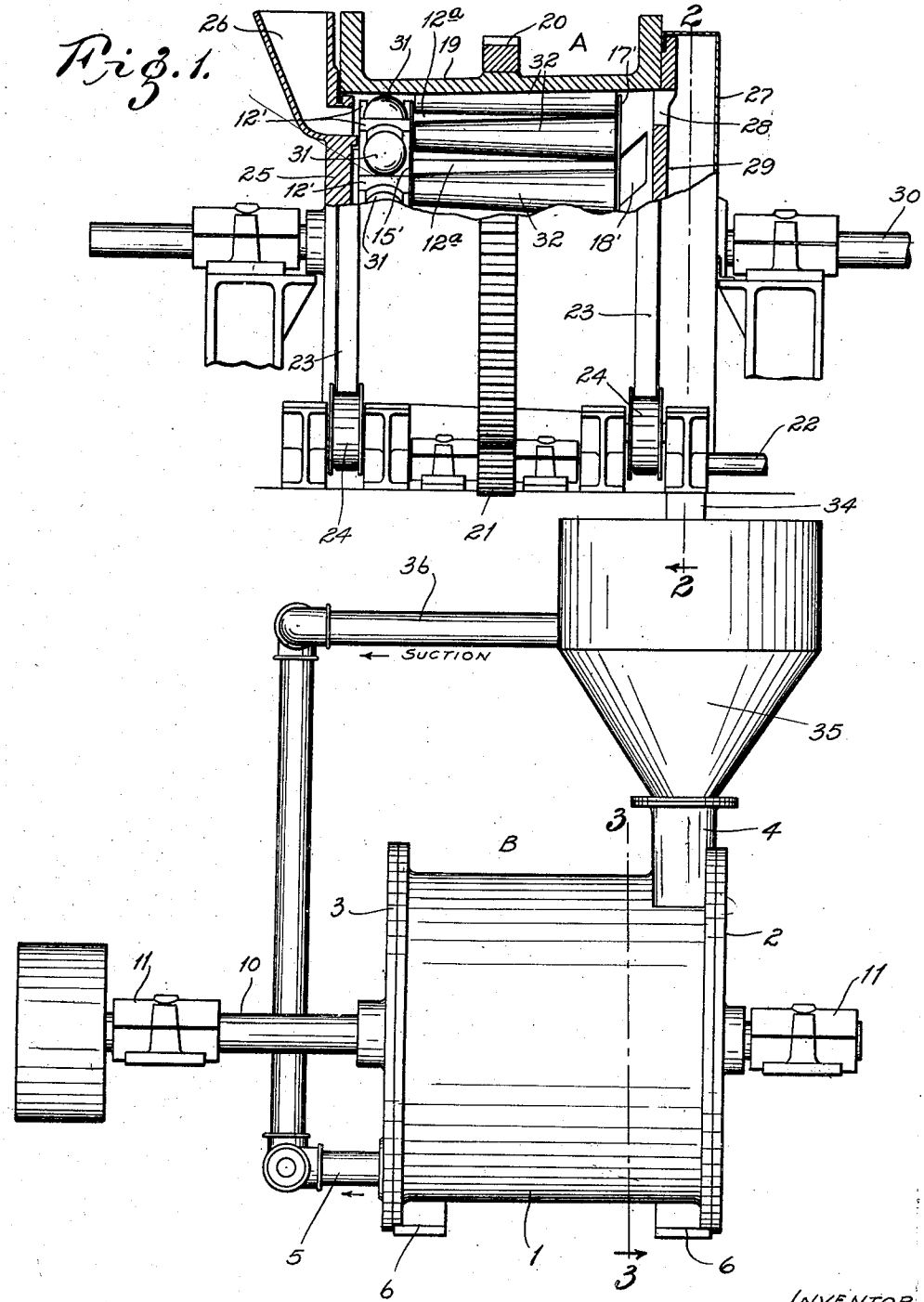
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DISINTEGRATOR

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Fig. 1.



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DISINTEGRATOR

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Fig. 2.

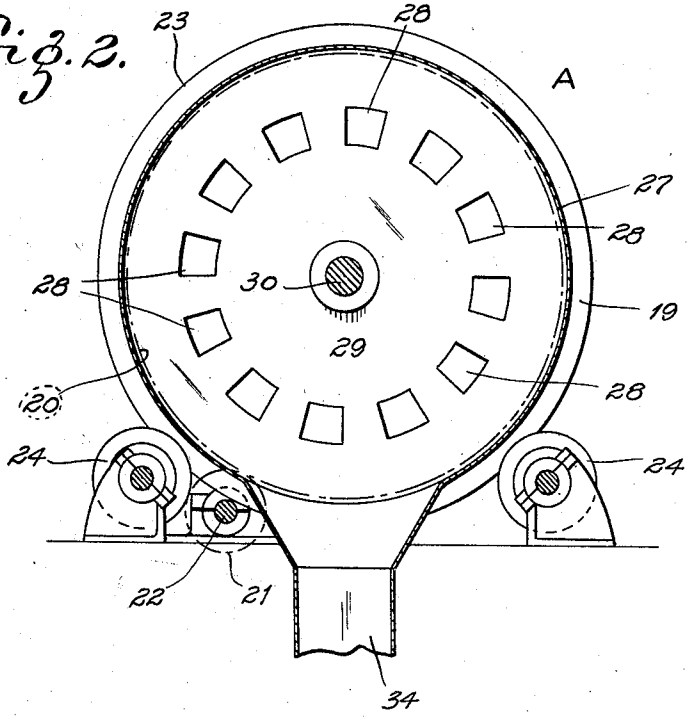
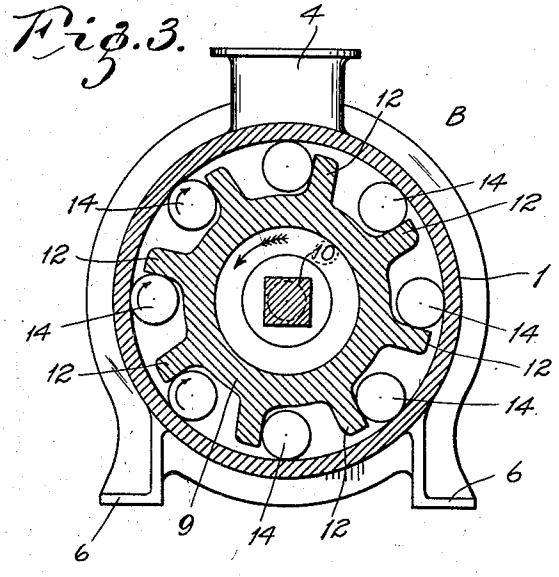


Fig. 3.



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Fig. 4.

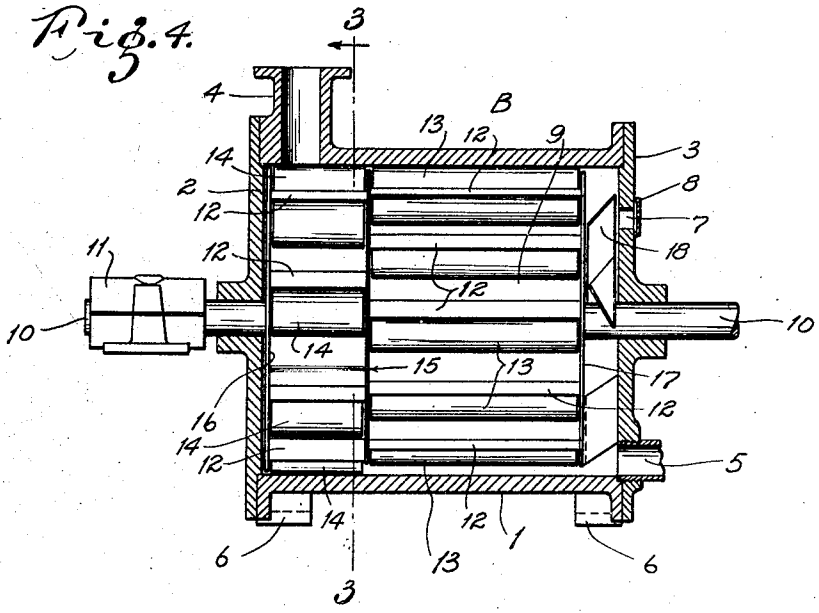
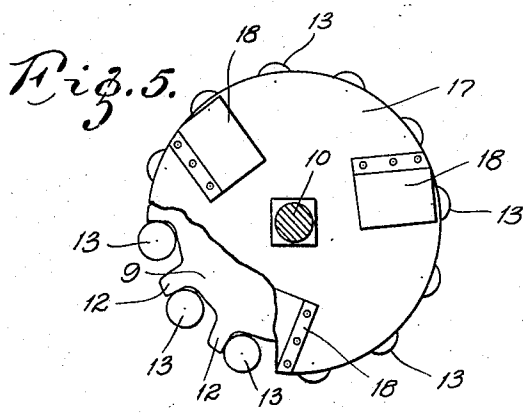


Fig. 5.



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UNITED STATES PATENT OFFICE

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DISINTEGRATOR

Application filed July 1, 1927. Serial No. 202,800.

This invention relates to disintegrators adapted to act upon various kinds of material such as coal, rock, etc. In this art there are three recognized processes of disintegration, namely, rolling, attrition and impact. Each process has some advantages not found in the others, but prior to this invention, the three processes of disintegration have not been successfully carried out during one operation.

One of the objects of this invention is to produce a disintegrator which not only subjects the material to the above named processes, but which successfully and efficiently causes the material to undergo these three processes during one operation.

Another object of this invention is to provide a device which may be installed between successive disintegrators to remove material of the required fineness, without removing the tailings which pass into the succeeding disintegrator.

With the foregoing and other objects in view, the invention comprises the novel method, construction, combination and arrangement of parts hereinafter more specifically described and illustrated in the accompanying drawings, wherein is shown the preferred embodiment of the invention. However, it is to be understood that the invention comprehends changes, variations and modifications which come within the scope of the claims hereunto appended.

Fig. 1 is a side elevation, partly in section, illustrating an apparatus embodying the features of this invention.

Fig. 2 is a vertical section taken approximately on the line 2—2 in Fig. 1, showing the stationary casing through which material is discharged from a rotary casing.

Fig. 3 is a section taken approximately on the line 3—3 in Figures 1 and 4, showing a rotary device inside of a stationary casing.

Fig. 4 is a section through the stationary casing, showing the rotary device therein.

Fig. 5 is an end view of the rotor removed from the stationary casing, and a portion of the baffle plate being broken away to show some of the pushers which contact with the rolling elements.

In Fig. 1, A designates a disintegrator including a rotary casing, which will be hereafter described, located above a disintegrator B which receives material discharged from the upper disintegrator.

The lower disintegrator B is shown by Figures 1, 3, 4 and 5. It comprises a stationary cylindrical casing 1 closed by heads 2 and 3, but it is to be understood that the casing may be of any suitable shape. Material to be pulverized in the casing B is introduced through an inlet 4 while the pulverulent material is discharged through the outlet 5. 6 designates legs for supporting the stationary casing. The head 3 (Fig. 4) is provided with ports 7 for admitting air to the discharge end of the casing, so as to provide for air sweeping whenever this is necessary or desirable. The admission of air may be regulated by opening or closing a cover 8 at the port 7.

9 designates a rotor secured to a shaft 10 which is supported in bearings 11. The periphery of the rotor 9 is provided with pushing elements 12 separated from each other to form recesses in which rolling elements 13 and 14 are placed. The directions of rotation of the rotor and rolling elements are shown by arrows in Fig. 3. These rolling elements may be of any desired shape.

The rolling elements 14 (Fig. 4) are preferably larger than the rolling elements 13, and these elements are separated from each other by a circular member 15 which retards the material tending to pass from the elements 14 to elements 13. It is also beneficial to have the recesses which receive the rolling elements 14 staggered, or offset, relative to the recesses which receive the rolling elements 13, thereby presenting additional resistance to the flow of material through the disintegrator.

Flanges 16 and 17 prevent excessive axial movement of the rolling elements 13 and 14. The flange, or plate 17 also limits the discharge of material from the disintegrator B.

18 designates agitator paddles, or wings, placed on the plate 17 at such angles to a radial line, and with the axis of the rotor, that they impart a fanning as well as a con-

veying action to the pulverulent material. This flange or plate 17 is mounted on a square portion of the shaft 10, as shown in Fig. 5, so as to turn with the rotor.

Figures 1 and 2 illustrate the disintegrator A which is provided with a rotary casing 19 revolving in the direction opposite to that in which the rotor revolves. 20 is a ring gear which meshes with a pinion 21, the pitch circles of this gearing being indicated by dotted lines in Fig. 2. Power for revolving the gear 20 and casing 19 is transmitted to pinion 21 through a shaft 22 to which the pinion is secured.

23 designates circular tracks formed on the casing 19 and resting on trunnions 24 on which the casing 19 revolves. One end of this casing is closed by a stationary head 25 provided with an inlet 26 for the material to be acted upon, and the opposite end is closed by a stationary casing 27 into which the pulverulent material is discharged through openings 28 in a head 29 carried by a shaft 30 which is secured to the rotor in the casing 19. This rotor is provided with recesses to receive rolling elements which may be in the form of balls 31 at the intake end of the casing, and conical rolls 32 receiving the material passing from the balls. However, it is to be understood that the invention is not limited to rolling elements of any particular shape. These rolling elements in the casing 19 are acted upon by pushers 12′ and 12ª. A baffle plate 15′ lies between the rolling elements 31 and 32. The casing 19 is also provided with a flange, or plate, 17′ having wings 18′ corresponding to the elements 17 and 18 shown by Figures 4 and 5. The material discharged from the rotary casing 19 flows through the stationary casing 27 and passes out through a discharge spout 34 to a hopper 35 leading to the inlet 4 of the disintegrator B. A suction pipe 36 extends from the hopper 35 to produce a classifying device whereby material of the required fineness is removed from the pulverulent material while the large tailings drop into the disintegrator B.

The material introduced into each of the casings 1 and 19 is subjected to three of the recognized processes of disintegration.

First—Rolling.—The material is rolled over and crushed by the rolls or balls revolving about their own axes.

Second—Attrition.—The material is drawn between the rolls and those faces of the recesses acting as the pushers for the rolls. The slippage between the pushers and the rolls revolving on their own axes creates an intense and effective rubbing action. These pushers may be specifically termed "grinding ribs," as they have flat longitudinal grinding faces approximately parallel with the axis of rotation, and these straight grinding ribs extend radially beyond the points of contact between said grinding faces and the rolling elements, to provide inlets for the material to be ground.

Third—Impact.—The equivalent of a blow is given the material at each rotation of the rotating member, due to the fact that during the upward travel of the rolls the material to be pulverized is subjected to a force varying from the centrifugal force imparted to the rolls by their rotation about the center of the cylindrical casing, plus all or part of their weight, to the centrifugal force minus the weight of the roll, and then subjected to the reverse action on the downward travel.

It is evident that the impacting action becomes a smaller percentage of the crushing force applied, the higher speed of the rotor, centrifugal force increasing as the square of the speed. Hence in order to maintain the impacting action and increase the crushing action of the mill it is possible to revolve the casing in a counter direction to that of the rotor. This increases the surface over which the rolls travel in a given time without augmenting the centrifugal force in the rolling elements.

I claim:

1. In a disintegrator, a casing, a rotor in said casing, two sets of rolling elements between said rotor and casing, and baffles for retarding the flow of material through the disintegrator, one of said baffles being between said sets and the other being provided with agitator wings to stir the material in the casing.

2. In a disintegrator a casing provided with an inlet and an outlet, rotor members within said casing having recesses in their outer surfaces, and rolling elements located in said recesses, the recesses of one of said rotor members being offset relative to the recesses in the other member to prevent free communication between adjacent recesses.

3. In an apparatus for pulverizing material, a plurality of disintegrators each comprising a casing having an inlet and an outlet, a rotor in said casing and rolling elements located between said rotor and casing, a conductor through which material is transmitted from the outlet of one disintegrator to the inlet of the other, and means whereby material of the desired fineness is withdrawn from said conductor.

In testimony that I claim the foregoing I hereunto affix my signature.

WILLIAM M. DUNCAN.