G. W. O'BRYAN.

CRUSHING AND GRINDING MILL.

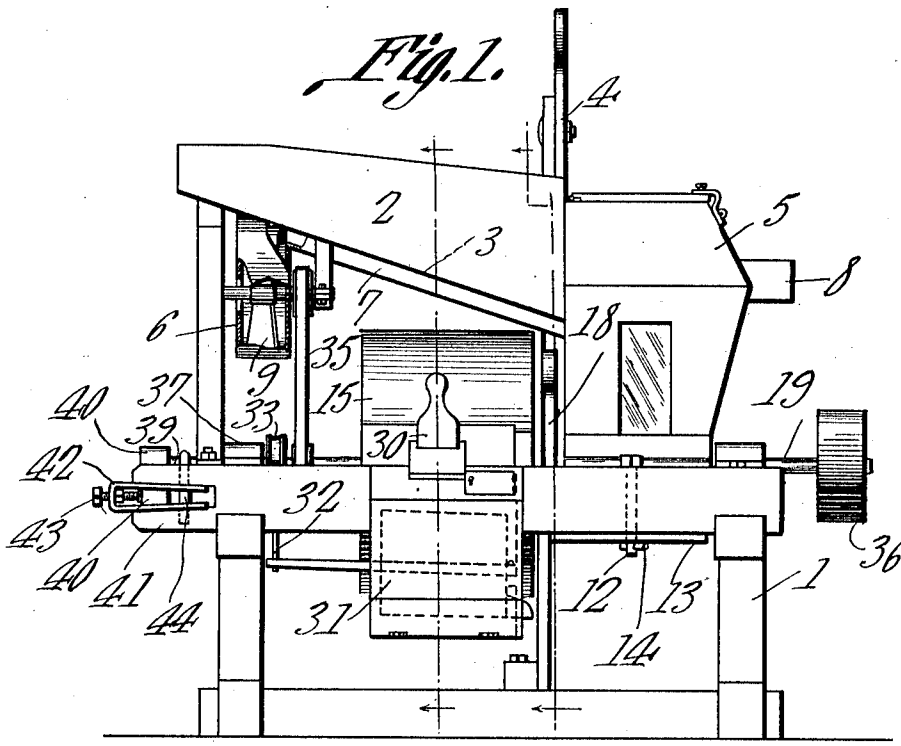
APPLICATION FILED JAN. 16, 1911.

1,019,828.

Patented Mar. 12, 1912.

3 SHEETS—SHEET 1.

Fig. 1.



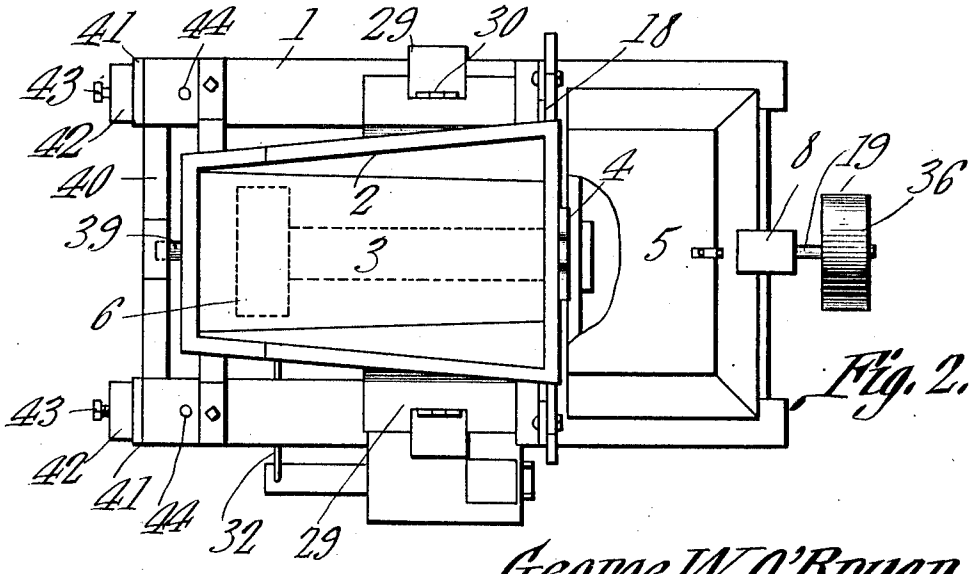


Fig. 2.

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3 SHEETS—SHEET 2.

Fig. 3.

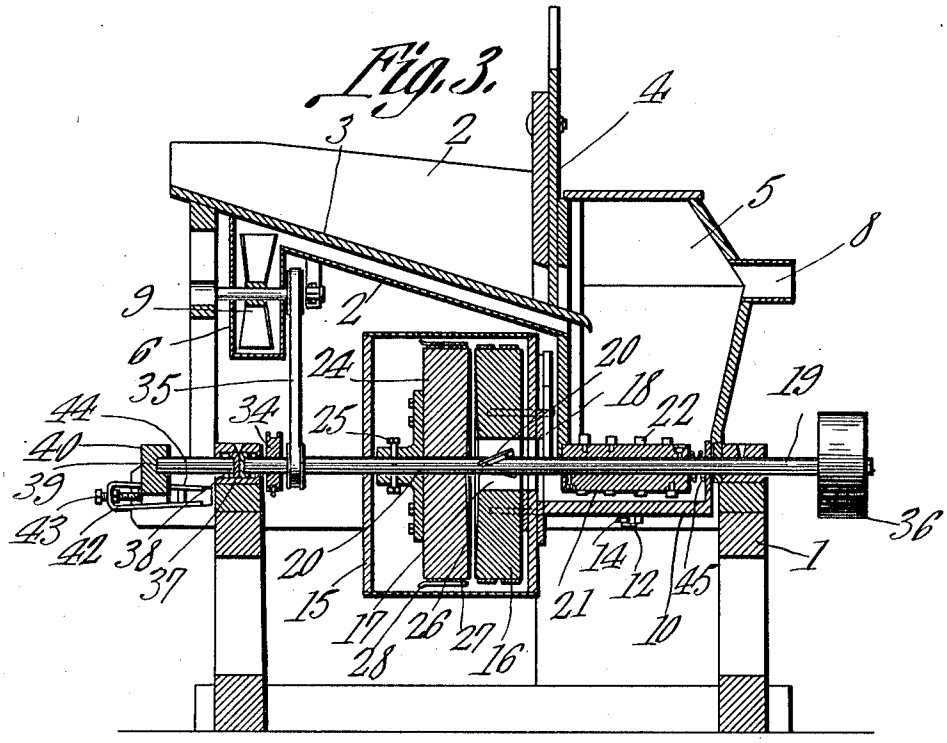


Fig. 7.

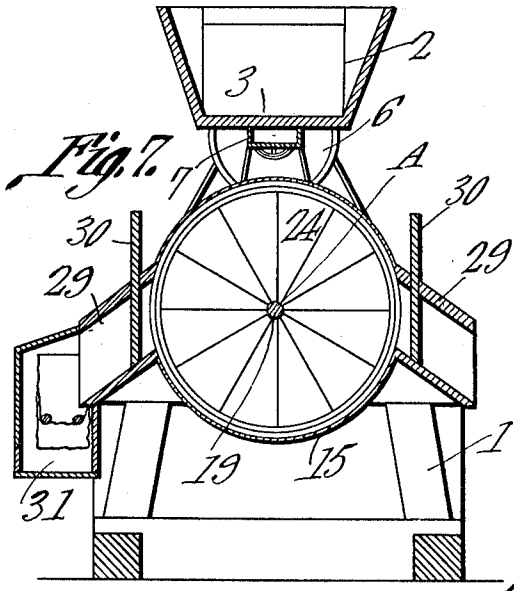
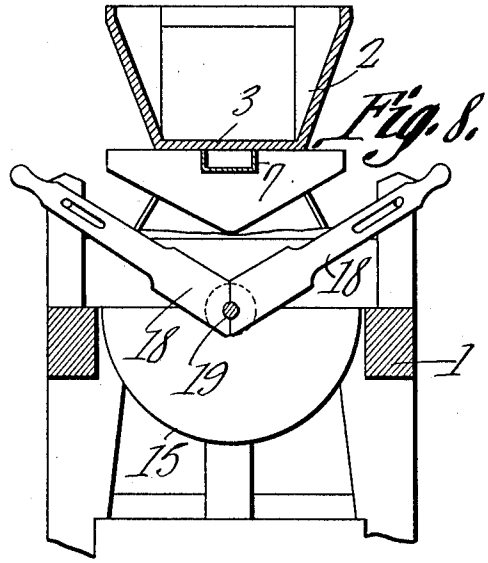


Fig. 8.



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3 SHEETS—SHEET 3.

Fig. 4.

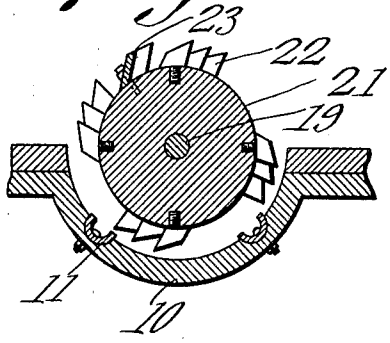
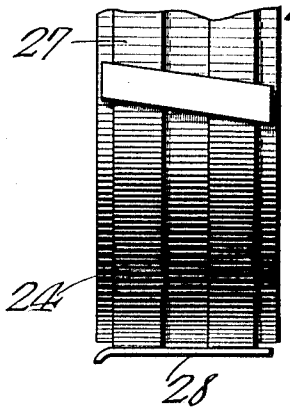


Fig. 5.



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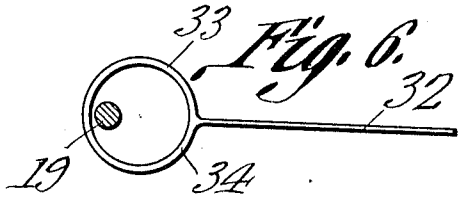

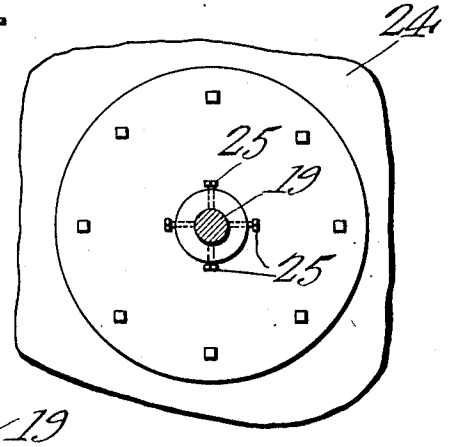

Fig. 9.

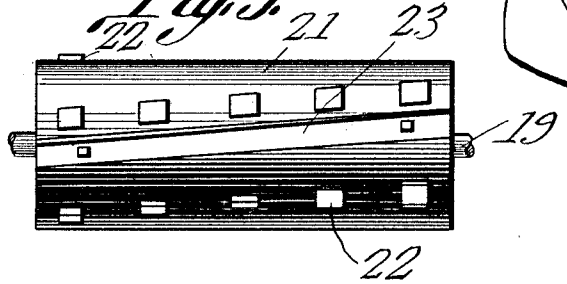

Fig. 10.

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UNITED STATES PATENT OFFICE.

GEORGE W. O'BRYAN, OF CAMBRIA, VIRGINIA.

CRUSHING AND GRINDING MILL.

1,019,828. Specification of Letters Patent. Patented Mar. 12, 1912.

Application filed January 16, 1911. Serial No. 602,935.

To all whom it may concern:

Be it known that I, GEORGE W. O'BRYAN, a citizen of the United States, residing at Cambria, in the county of Montgomery and State of Virginia, have invented a new and useful Crushing and Grinding Mill, of which the following is a specification.

This invention has relation to crushing and grinding mills and consists in the novel construction and arrangement of parts as hereinafter shown and described.

The object of the invention is to provide a mill of simple structure which will effectually crush and grind corn on the cob or other cereals and separate the ground material into quantities of like character.

With the above object in view the mill includes a frame upon which is located a bin having a crusher in its bottom. A chute is arranged to discharge in the bin and an air blast trunk is arranged to discharge in the bin immediately below the delivery end of the chute, the blast of air from the said trunk being caused to pass transversely across the bin and through the material as it falls from the chute. Grinding stones are arranged upon the frame and are adapted to receive the crushed material from the crusher. One of these stones is held in a stationary position while the other coöperating stone is arranged to rotate. The crushed material is fed between the stones through an opening provided in the center of the stationary stone and the said stones are provided upon their inner faces with concavities having ridges and furrows which constitute the grinding surfaces. Lifting devices are carried by the rotatable stone and bolters are pivotally mounted upon the frame and adapted to receive the ground material from the said lifting devices. The crusher and the grinding elements are held in normal positions by pins which when subjected to excessive stress are adapted to spread thus permitting the parts to separate and allowing a relatively large and hard foreign object to pass out of the mill without damaging the parts thereof.

In the accompanying drawings—Figure 1 is a side elevation of the mill. Fig. 2 is a top plan view of the same. Fig. 3 is a longitudinal sectional view of the same. Fig. 4 is a transverse sectional view of the crusher of the mill. Fig. 5 is an edge elevation of a portion of one of the grinding stones in the mill. Fig. 6 is a side elevation of an eccentric forming a part of the mill. Fig. 7 is a vertical transverse section through the machine, said section being taken along the line indicated in Fig. 1 and which extends through the slide valves and the chutes. Fig. 8 is another vertical transverse section taken on the line indicated in Fig. 1 and which passes through the discharge end of the top chute. Fig. 9 is a detail view of the crushing cylinder. Fig. 10 is an elevation of a portion of one of the stones and showing the means for attaching it to its shaft.

The mill consists of a frame 1 having a chute 2 mounted upon its top which is provided with an inclined bottom 3 and a vertically slidable gate 4. A bin 5 is mounted upon the frame 1 and the delivery end of the chute 2 enters the upper portion of the said bin. A fan casing 6 is located under the chute 2 and a wind trunk 7 connects said fan casing with the interior of the bin 5, said trunk having its delivery end immediately under the delivery end of the chute 3. The bin 5 is provided with a wind outlet 8 which is located at the opposite side of the said bin from that side at which the trunk 7 enters the same. An air blast fan 9 is journaled for rotation in the casing 6.

A concave 10 forms the bottom of the bin 5 and the said concave is provided with approximately semi-circular ribs 11 which traverse the length of the said concave. Bolts 12 pass transversely through horizontal portions of the frame 1 and also through flanges 13 which form the edge portions of the concave 10 and snapping pins of wood or other fragile material 14 pass through the lower ends of the bolts 12 and lie under the flanges 13 of the said concave. Thus when the concave is subjected to an abnormal pressure or strain the pin 14 will break whereby the said concave will fall away from the lower end of the bin 5 and thus damage to the parts of the mill is prevented. A drum 15 is supported upon the frame 1 adjacent the side of the bin 5 and is preferably located under the chute 2. A grinding stone 16 is fixed in the drum 15 and is provided with an open center 17 which at times communicates with the lower end of the bin 5. Sliding valves 18 are provided between the bin 5 and the drum 15 and may be moved to increase or diminish the transverse sectional area of the opening which connects the interiors of the said bin and drum. The stone 16 is supported in a vertical position in the drum 15

as illustrated in Fig. 3 of the drawings. A shaft 19 is journaled in bearings provided upon the frame 1 and traverses the length of the concave 10 and the drum 15 and passes through the center of the stone 16. The said shaft 19 is provided at that part which passes through the stone 16 with conveyer blades 20 which are adapted to operate in the opening 17 provided at the center of the said stone. A cylinder 21 is mounted upon the shaft 19 within the concave 10 and the said cylinder is provided upon its periphery with crushing teeth 22. The cylinder 21 is also provided with a cutting blade 23 which is approximately spirally disposed upon the periphery of the said cylinder and is adapted to coöperate with the ribs 11 to reduce the material which enters the concave 10 to fragments. A stone 24 is fixed to the shaft 19 and is located within the drum 15. The said stone 24 is held in a fixed position upon the shaft by means of four set screws 25 which pass transversely through the hub of the said stone and at their inner ends engage the surface of the shaft 19. The stone 24 is also in a vertical position and the inner faces of the stones 16 and 24 are slightly concaved as at 26 and are provided with appropriate grinding ridges and furrows. The stone 24 is provided upon its periphery with strips 27 upon which are located a series of spirally disposed lifting bars or members 28. The drum 15 is provided at its opposite side and at points approximately midway between its upper and lower side with inclined delivery chutes 29 each having a slide valve 30. Bolters 31 are pivotally connected with the frame 1 and are located under the delivery end of the chutes 29. Any suitable means may be provided for operating the bolters 31 and as illustrated in the drawings such means may consist of a rod 32 which is pivotally connected at one end with the bolter and at its other end is provided with a strap 33 which surrounds an eccentric 34 mounted upon the shaft 19. A belt 35 operatively connects the said shaft 19 with the fan 9 located in the casing 6. A drive pulley 36 is mounted upon the shaft 19.

One end of the shaft 19 is journaled in a box 37 mounted upon the frame 1 and also located in the said box are two cup-shaped washers 38 one of which receives the end portion of the shaft 19 and the other receives the end portion of a stub shaft 39 which is in longitudinal alinement with the said shaft 19. The outer end of the stub shaft 39 is journaled in a cross bar 40 which is slidably mounted at its ends in guides 41 provided upon the frame 1. Yokes 42 are also located between the guides 42 and receive the end portions of the bar 40. Thrust screws 43 are threaded through the intermediate portions of the yokes 42 and at their inner ends bear against the sides of the end portions of the bar 40 and serve as means whereby the said bar may be shifted in its position with relation to the guides 41. Snapping pins 44 pass transversely through the beams of the frame 1 which are provided with the guides 41 and also pass transversely through the end portions of the yokes 42. Therefore it will be seen that if during the grinding operation the shaft 19 is subjected to excessive end thrust the said shaft will be moved longitudinally whereby the stone 24 will be carried away from the stone 16 and any foreign objects between the said stones may fall down into the drum 15. As the shaft 19 moves longitudinally the shaft 39 is correspondingly moved and the cross bar 40 is moved outwardly along the guides 41 carrying with it the thrust screws 43 and yokes 42. As the said yokes 42 move they break the pins 44 and therefore the foreign object may pass through the grinder of the mill without damaging the parts thereof. A coil spring 45 surrounds the shaft 19 and is located between the ends of the concave 10 and the end of the cylinder 21 mounted upon the said shaft. The spring 45 is under tension with a tendency to hold the cylinder 21 toward the opening in the stone 16. Therefore when the pins 44 are broken as above described, the tendency of the spring 45 will be to hold the stone 24 away from the stone 16. As the material is deposited in the chute 2, it will pass down along the inclined bottom thereof and under the lower edge of the sliding valve 4 into the bin 5. At the same time a blast of air is coming from the fan 9 in the casing 6 through the trunk 7 and is admitted into the bin 5 under the delivery end of the chute 2. This blast of air passes through the material and catches the fine trash contained by the material and carries across the bin 5 and out through the outlet 8. The material falls upon the cylinder 21 and is engaged by the teeth 22 thereof and the blade 23 and is carried around in contact with the ribs 11 in the concave 10. Thus the material is reduced to fragments and is passed by the disposition of the blade 23 and teeth 22 toward the opening 17 in the fixed stone 16. When the material enters the said opening it is engaged by the blades 20 which force the same through the opening to the space between the stones 24 and 16. The material then passes down between the stones and is subjected to the grinding action of the stone 24 which is rotating and thus the fragments of material are reduced to fine granular form. The material thus reduced is engaged by the bars 28 and carried up and passed out of the drum 15 through one of the chutes 29 and falls into one of the bolters 31 where the material of different characters is separated into quantities.

Having described the invention what I claim as new and desire to secure by Letters Patent is:

1. In a grinding mill, a revoluble grinding element, a band secured to and engaging the periphery of said element, elevating means secured to the band, and means outstanding from said elevating means for retarding movement of the ground material laterally beyond the periphery of said element.

2. In a grinding mill, the combination with a revoluble shaft, a fixed grinding element, and a grinding element movable with the shaft, of a cross bar constituting a thrust bearing for the shaft, yokes embracing the ends of the bar, adjustable connections between the ends of the bar and the yokes for shifting the bar toward the shaft, a supporting structure, and snapping pins constituting the sole connections between the yokes and the supporting structure.

3. In a grinding mill, the combination with a revoluble shaft, a fixed grinding element, and a grinding element movable with the shaft, of a cross bar constituting a thrust bearing for the shaft, yokes embracing the ends of the bar, adjustable connections between the ends of the bar and the yokes for shifting the bar toward the shaft, a supporting structure, snapping pins constituting the sole connections between the yokes and the supporting structure, and a spring engaging the shaft for shifting said shaft longitudinally against the bar to move the revoluble grinding element away from the fixed element and to shift the bar when the snapping pins are broken.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

GEORGE W. O'BRYAN.

Witnesses:
D. S. TOMPKINS,
M. A. TOMPKINS.