July 6, 1926. 1,591,560

R. PRATER

GRINDER

Filed Sept. 5, 1925 4 Sheets-Sheet 1

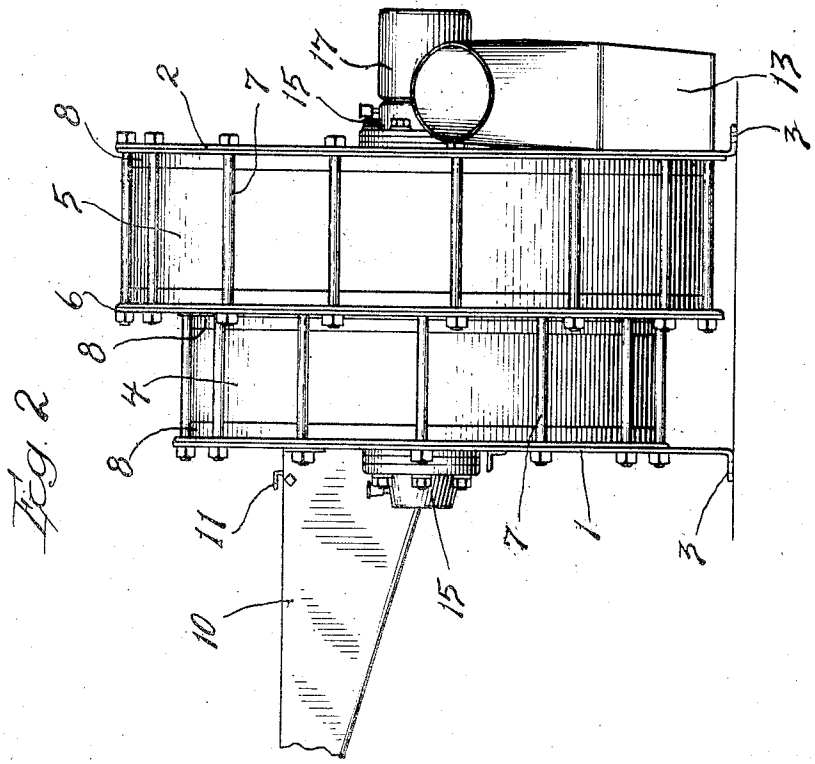


Fig. 2

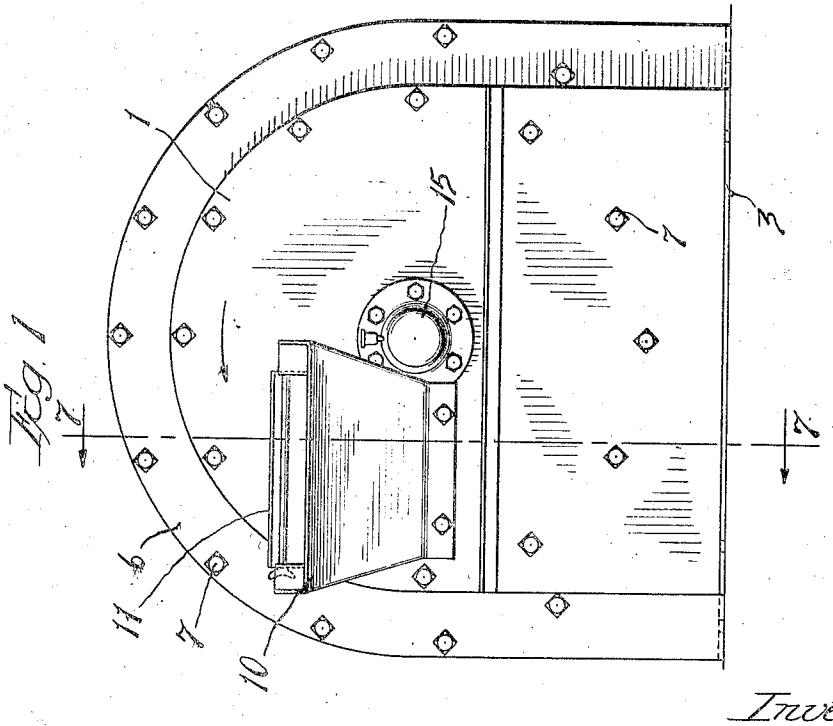


Fig. 1

Inventor:
Ralph Prater
By- Michle & Michle Attys.

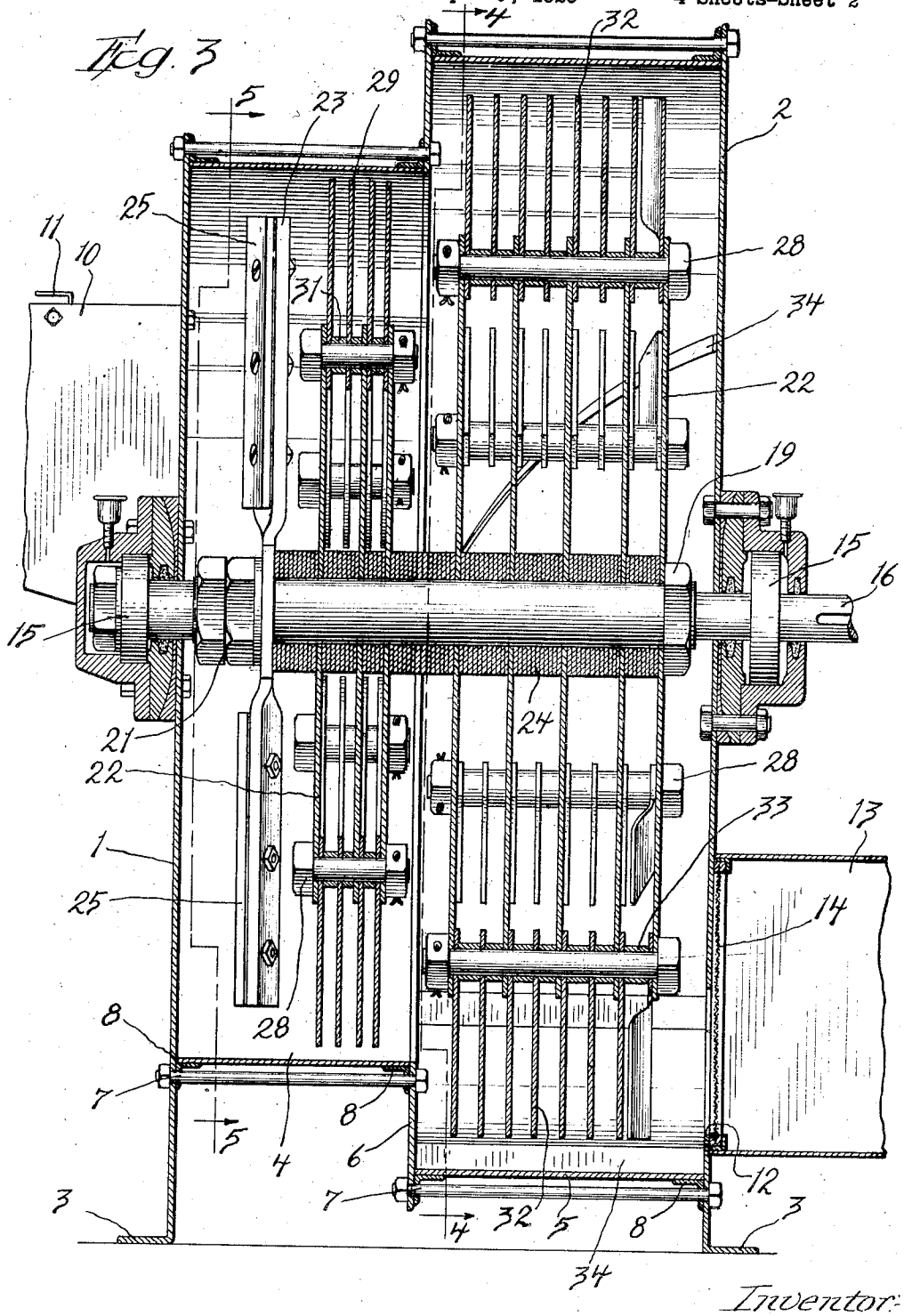
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GRINDER

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Fig. 3



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R. PRATER

GRINDER

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Fig. 4

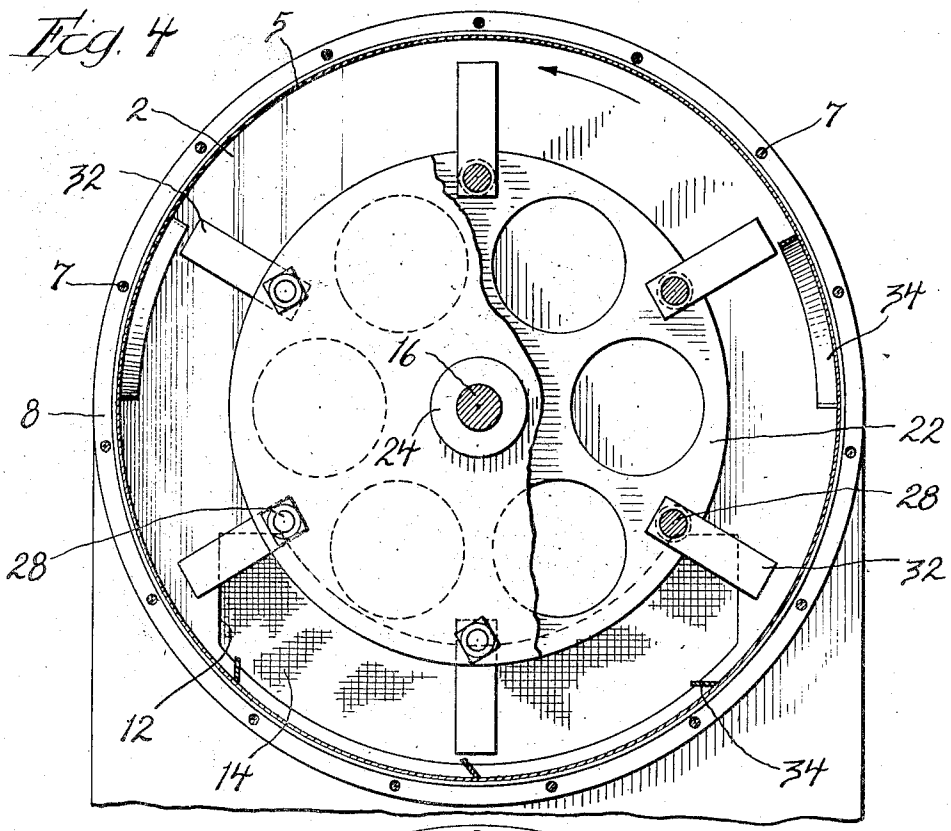
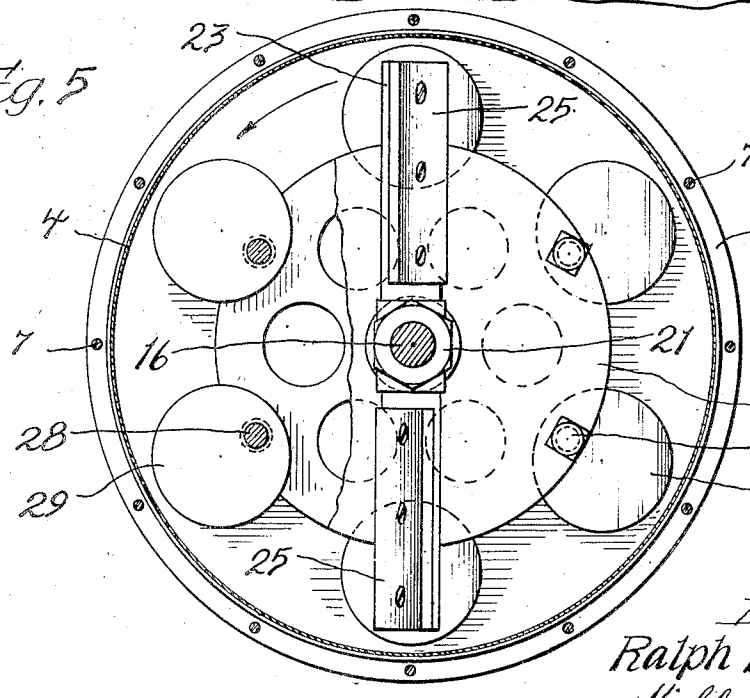


Fig. 5



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R. PRATER

GRINDER

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Fig. 6

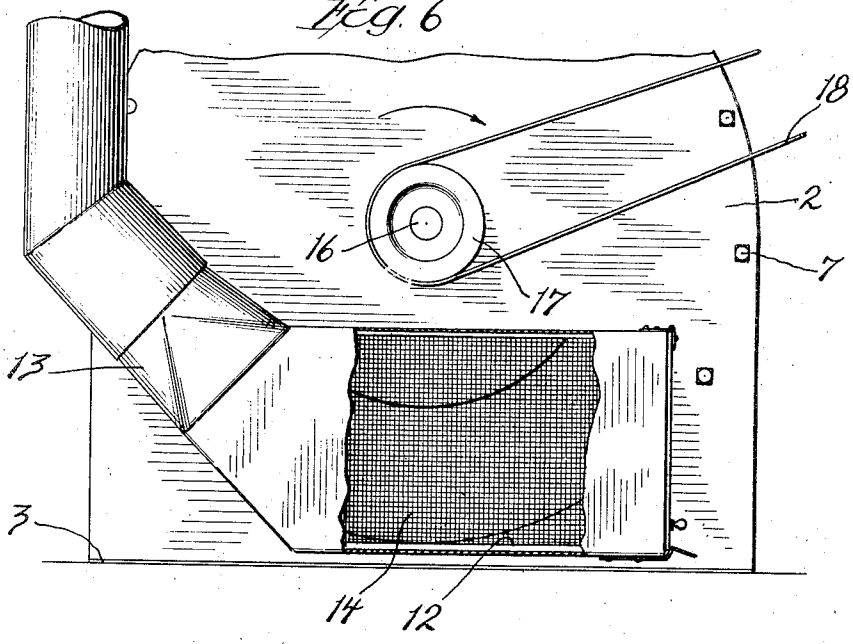


Fig. 7

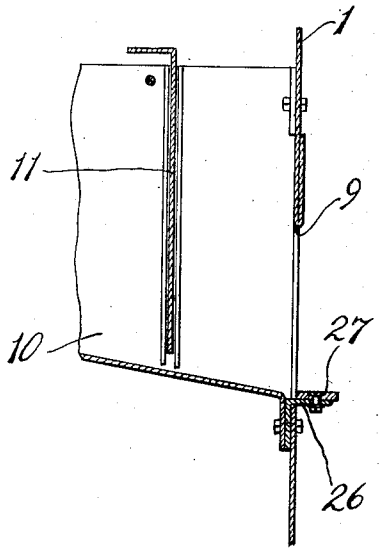
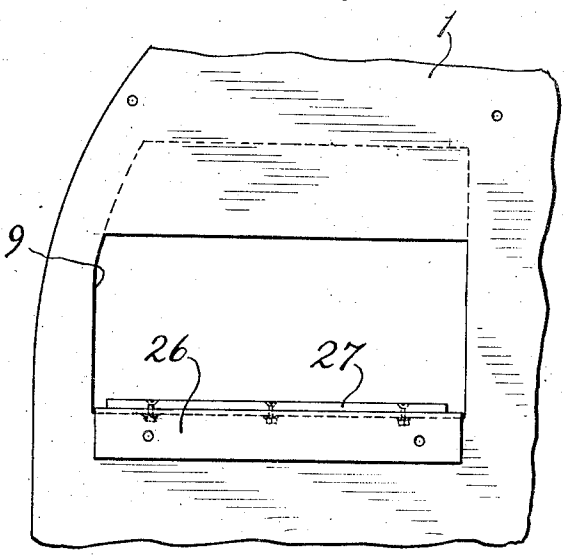


Fig. 8



Inventor:
Ralph Prater
By: Miehle & Miehle, Attys.

Patented July 6, 1926.

1,591,560

UNITED STATES PATENT OFFICE.

RALPH PRATER, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO JAMES B. KLING, CARL W. KLING, PAUL E. KLING, AND OLAF E. KLING, ALL OF CHICAGO, ILLINOIS.

GRINDER.

Application filed September 5, 1925. Serial No. 54,707.

My invention relates particularly to grinders of the type adapted for reducing or pulverizing materials of various kinds.

The main object of the invention resides in the provision of a simple and efficient grinder of the above type with a view toward economy in operation particularly with reference to power required in the operation thereof.

With this object in view my invention consists in certain features of novelty in the construction, combination, and arrangement of parts by which the said object and certain other objects, hereinafter appearing, are effected all as fully described with reference to the accompanying drawings and more particularly pointed out in the appended claims.

In the said drawings—

Figure 1 is an end elevation of a grinder embodying my invention.

Figure 2 is a side elevation of the same.

Figure 3 is an enlarged central vertical longitudinal section of the same.

Figure 4 is a sectional view on the line 4—4 of Fig. 3.

Figure 5 is a sectional view on the line 5—5 of Fig. 3.

Figure 6 is a partial end elevation of the grinder taken oppositely with respect to Fig. 1 and with parts broken away.

Figure 7 is a partial section on the line 7—7 of Fig. 1.

Figure 8 is a partial interior view showing the inlet opening of the casing and related parts, hereinafter described.

Like characters of reference indicate like parts in the various views.

Referring to the drawings, the casing of the grinder is constructed as follows. Sheet metal plates 1 and 2 form the ends of the casing, the lower portions thereof being extended and bent to form feet 3 by means of which the grinder is supported. The end plates 1 and 2 are disposed in spaced parallelism, and disposed therebetween are two cylindrical sheet metal wall members 4 and 5 separated by a sheet metal annular member 6, the assembly being secured as a unit by bolts 7 passing through apertures in respective end plates and the annular member exterior of the cylindrical wall members and clamping the wall members 4 and 5 between respective end plates and the annular member, angle irons 8 welded to the end plates and annular member extending around the exterior of the cylindrical wall members to form suitable joints and having the bolts 7 passing through apertures therethrough.

The cylindrical wall members 4 and 5 and the annular member 6 are disposed coaxially, and the cylindrical wall member 5 has a larger diameter than the cylindrical wall member 4, thus forming a cylindrical casing having two sections of different diameters.

The end plate 1 is provided with an inlet opening 9, and an inclined hopper or chute is secured on the exterior of the plate 1 for feeding material to be ground into the grinder through the inlet opening, a suitable shutter 11 being provided in the hopper for regulating the flow of material. See Figs. 1, 2, 7, and 8.

The end plate 2 is provided with an outlet opening 12, and a conduit 13 leads from this opening for conducting the ground material from the grinder, a screen 14 being preferably provided at the outlet opening for insuring that only such material as will pass through the screen passes out of the grinder. See Figs. 2, 3, and 6.

Mounted in suitable bearings 15 on respective end plates 1 and 2 and extending within the casing axially thereof is a shaft 16 upon one end of which exterior of the casing, is secured a pulley 17 for driving the shaft by means of a belt 18. See Figs. 2, 3, and 6.

Screwthreaded and welded upon the shaft 16 and disposed adjacent the inside of the end plate 2 is a nut 19, and clamped on the shaft between this nut and nuts 21, screwthreaded on the shaft and disposed adjacent the inside of the end plate 1, are a plurality of spaced apertured sheet metal carrier disks 22 and a rotatory shear member 23, the shear member 23 being disposed adjacent the end plate 1 and the inlet opening 9 thereof and the disks 22 being disposed between the shear member and the end plate 2 and spaced from each other and the shear member by spacing washers 24 on the shaft 16. Thus the shear member 23 and the carrier disks are secured on the shaft 16 for rotation therewith, the shear member being additionally secured to the shaft by a usual key, not shown.

The shear member 23, as shown, com-

prises two diametrically opposite arms upon which are detachably secured cutting blades 25. Secured to the end plate 1 and extending along the lower edge of the inlet opening 9 is an angle bar 26 one leg of which projects inwardly. Adjustably secured on this leg of the angle bar 26 is a shear block or blade 27 which cooperates with the blades 25 of the shear member in its rotation in the proper direction to shear material directly as it passes into the casing through the inlet opening 9.

The carrier disks 22 lie both in the small section of the casing between the shear member 23 and the larger section of the casing and in the larger section, the diameters of the disks being considerably smaller than the diameters of the respective sections. Spaced about the axis of the carrier disks of each set adjacent the peripheries thereof are bolts 28 which extend in parallelism with said axis through respective registering apertures in the disks. A plurality of circular impact cutting plates 29 are spaced along each bolt 28 of the carrier disks 22 in the small section of the casing and are eccentrically pivoted thereon in spaced relation by reason of these bolts 28 passing through eccentrically disposed apertures in the plates, and the carrier disks and spacing collars 31 on these bolts spacing the plates. See Figs. 3 and 5. The circular plates 29 are thus disposed in planes normal to the axis of rotation and are eccentrically pivoted on axes parallel thereto. During rotation of the shaft 16 the plates 25 swing outwardly beyond the respective carrier disks 22 into the positions shown in the drawings, and in these positions sweep adjacent the cylindrical wall of the smaller section of the casing.

A plurality of elongated impact cutting plates 32, provided with straight longitudinal edges, are spaced along each bolt 28 of the carrier disks 22 in the large section of the casing and are pivoted adjacent ends thereof on these bolts in spaced relation by reason of the bolts 28 passing through apertures in the plates, and the carrier disks and spacing collars 33 on the bolts spacing the plates. See Figs. 3 and 4. The plates 32 are thus disposed in planes normal to the axis of rotation and are pivoted at ends thereof on axes parallel thereto. During rotation of the shaft 16 the plates 32 swing outwardly beyond the respective carrier disks 22 into the positions shown in the drawings, and in these positions sweep adjacent the cylindrical wall of the larger section of the casing.

In the operation of the grinder the shaft 16 is driven at a comparatively high speed in the direction of the arrows in the drawings. Material passes into the casing through the inlet opening 9. It is first shear cut into suitable pieces by the shear cutting means comprising the shear member 23 with the blades 25 thereon and the stationary shear block 27. Then the material so cut passes to the cutting means comprising the circular plates 29 where the second reduction of the material takes place, the plates 29 cutting the material in suspension. Finally the material passes into the large section of the casing and to the cutting means comprising the plates 32 where the third reduction of the material takes place, the plates 32 cutting the material in suspension.

The arms of the shear member 23 and the plates 32 adjacent the end plate 2 are arranged helically in the direction to create an air current from the inlet opening to the outlet opening, and the current so created serves to feed the material in the casing to the outlet opening. After the material is sufficiently reduced to pass through the screen 14 it is forced by the air current through the outlet opening 12 into the conduit 13 for discharge.

The plates 29 being circular present curved edges to the material thus lowering the resistance of their cutting through the only partially reduced material. The plates 32 present straight edges to the material thereby effecting a direct impact cutting action which is conducive to a finer reduction of the material, the resistance of these plates in passing through the material, considerably reduced by the previous reducing operations, not being excessive.

The plates 32 are disposed at greater radii with respect to the axis of rotation than those at which the plates 29 are disposed, in accordance with the diameters of the respective sections of the casing, whereby the lineal speed of the plates 32 is greater than that of the plates 29 and whereby the plates 32 are additionally adapted for cutting or reducing the material to a greater extent than the plates 29.

Retarding formations 34 are preferably arranged on the interior of the cylindrical wall of the large section of the casing to prevent any tendency of the material revolving as a mass with the plates 32.

The pivotal mounting of the plates 29 and 32 permits them to fold back in the event that an obstruction is encountered with a view toward preventing damage.

It will be observed that the reduction of the material in the grinder is accomplished progressively with a plurality of cutting means acting sequentially and having different reducing characteristics with respect to fineness of reduction and being arranged to reduce progressively with consequent efficiency by reason of the lessening of resistance and resulting decrease in power necessary for operation.

While I have herein shown and particularly described the preferred embodiment of my invention I do not wish to be limited to the precise details of construction shown as changes may readily be made without departing from the spirit of my invention, but having thus described my invention I claim as new and desire to secure by Letters Patent the following:—

1. In a grinder the combination with a casing provided with spaced inlet and outlet openings, of shear cutting means within said casing and associated with said inlet opening and including a rotatory shear member, and rotatory impact reducing devices within said casing for further reducing material, cut by said shear cutting means, while in suspension in the passage of the material to said outlet opening.

2. In a grinder the combination with a casing provided with inlet and outlet openings at opposite ends thereof, of shear cutting means within said casing and associated with said inlet opening and including a rotatory shear member disposed on an axis extending longitudinally of the casing and in central relation therewith, and rotatory impact reducing devices within said casing between said shear member and said outlet opening and arranged along and about the axis of and secured with said shear member for rotation therewith and adapted for further reducing material, cut by said shear cutting means, while in suspension in the passage of the material to said outlet opening.

3. In a grinder the combination with a cylindrical casing provided with inlet and outlet openings at opposite ends thereof, of a revoluble shaft extending within the casing axially thereof, shear cutting means within the casing and associated with said inlet opening and including a rotatory shear member secured with said shaft for rotation therewith, and a plurality of rotatory impact cutting blades within said casing between said shear member and said outlet opening and arranged along and about said shaft and secured for rotation therewith and adapted for further cutting material, cut by said shear cutting means, while in suspension in the passage of the material to said outlet opening.

4. In a grinder the combination with a casing provided with spaced inlet and outlet openings, of shear cutting means within the casing and associated with said inlet opening and including a rotatory shear member, and rotatory impact reducing devices within said casing for further reducing material, cut by said shear cutting means, while in suspension in the passage of the material to said outlet opening, said shear member and certain of said impact reducing devices being adapted for creating an air current from said inlet opening to said outlet opening.

5. In a grinder the combination with a casing provided with inlet and outlet openings at opposite ends thereof, of shear cutting means within said casing and associated with said inlet opening and including a rotatory shear member disposed on an axis extending longitudinally of the casing and in central relation therewith, and a plurality of rotatory cutting blades within said casing between said shear member and said outlet opening and secured with said shear member for rotation therewith and adapted for further cutting material, cut by said shear cutting means, while in suspension in the passage of the material to said outlet opening, said shear member and cutting blades adjacent said outlet opening being disposed helically with respect to their axis of rotation in the direction to provide an air current from said inlet opening to said outlet opening.

6. In a grinder the combination with a casing provided with spaced inlet and outlet openings, of shear cutting means within said casing and associated with said inlet opening and including a rotatory shear member, and rotatory impact reducing devices within said casing for further reducing material, cut by said shear cutting means, while in suspension in the passage of the material to said outlet opening, said additional reducing devices being of different reducing characteristics with respect to fineness of reduction and being arranged to reduce progressively from said shear cutting means to said outlet opening.

7. In a grinder the combination with a casing provided with inlet and outlet openings at opposite ends thereof, of shear cutting means within said casing and associated with said inlet opening and including a rotatory shear member disposed on an axis extending longitudinally of the casing and in central relation therewith, and a plurality of rotatory cutting blades within said casing between said shear member and said outlet opening and spaced along and about the axis of and secured with said shear membr for rotation therewith and adapted for further cutting material, cut by said shear cutting means, while in suspension in the passage of the material to said outlet opening, said cutting blades being carried at different radii with respect to the axis of rotation and in progression with those of the largest radii adjacent the outlet opening, and said shear member and cutting blades adjacent said outlet opening being arranged helically with respect to their axis of rotation in the direction to provide an air current from said inlet opening to said outlet opening.

8. In a grinder the combination with a

cylindrical casing having inlet and outlet openings at opposite ends thereof and having two sections of different diameters with the larger section adjacent the outlet opening, of a revoluble shaft extending within the casing axially thereof, of shear cutting means within the small section of the casing and associated with said inlet opening and including a shear member secured with said shaft, and a plurality of cutting blades within the casing between said shear member and said outlet opening and spaced along and about and secured with said shaft for rotation therewith and adapted for further cutting material, cut by said shear cutting means, while in suspension in the passage of the material to said outlet opening, said cutting blades being carried at radii corresponding with the diameter of the section of the casing in which they lie and said shear member and cutting blades adjacent said outlet opening being arranged helically to provide an air current from said inlet opening to said outlet opening.

9. In a grinder the combination with a cylindrical casing provided with inlet and outlet openings at opposite ends thereof and having two sections of different diameters with the larger section adjacent the outlet opening, of a revoluble shaft extending within the casing longitudinally thereof and in central relation therewith, of shear cutting means within the small section of the casing and associated with said inlet opening and including a shear member secured with the shaft, a second reducing means within the small section between said shear member and the large section and comprising a plurality of blades provided with curved edges and arranged along and about the shaft and carried thereby for rotation and disposed to present said curved edges to material to be reduced in the rotation of the shaft, and a third reducing means within the larger section comprising a plurality of plates provided with straight edges and arranged along and about the shaft and carried thereby for rotation and disposed to present said straight edges to material to be reduced in the rotation of the shaft, said plates being disposed to sweep adjacent the circumferential walls of the respective sections.

10. In a grinder the combination with a cylindrical casing provided with inlet and outlet openings at opposite ends thereof and having two sections of different diameters with the larger section adjacent the outlet opening, of a revoluble shaft extending within the casing axially thereof, of shear cutting means within the small section of the casing and associated with said inlet opening and including a shear member secured with the shaft, a second reducing means within the small section between said shear member and the larger section comprising a plurality of circular plates spaced about and along the axis of the shaft and disposed in planes normal thereto and eccentrically pivoted on a carrier to the shaft on axes parallel with the axis of the shaft, and a third reducing means within the larger section and comprising a plurality of elongated plates provided with straight longitudinal edges and spaced along and about the axis of the shaft and disposed in planes normal thereto and pivoted adjacent ends thereof on a carrier secured to the shaft on axes parallel with the axis of the shaft, said plates being disposed to sweep adjacent the circumferential walls of the respective sections and said shear member and the plates adjacent the outlet opening being arranged helically in the direction to provide an air current from the inlet opening to the outlet opening.

In witness whereof I hereunto affix my signature this third day of September, 1925.

RALPH PRATER.