

Dec. 19, 1922.

1,439,581.

J. B. SEDBERRY.
GRINDING MILL.
FILED DEC. 8, 1920.

4 SHEETS—SHEET 1.

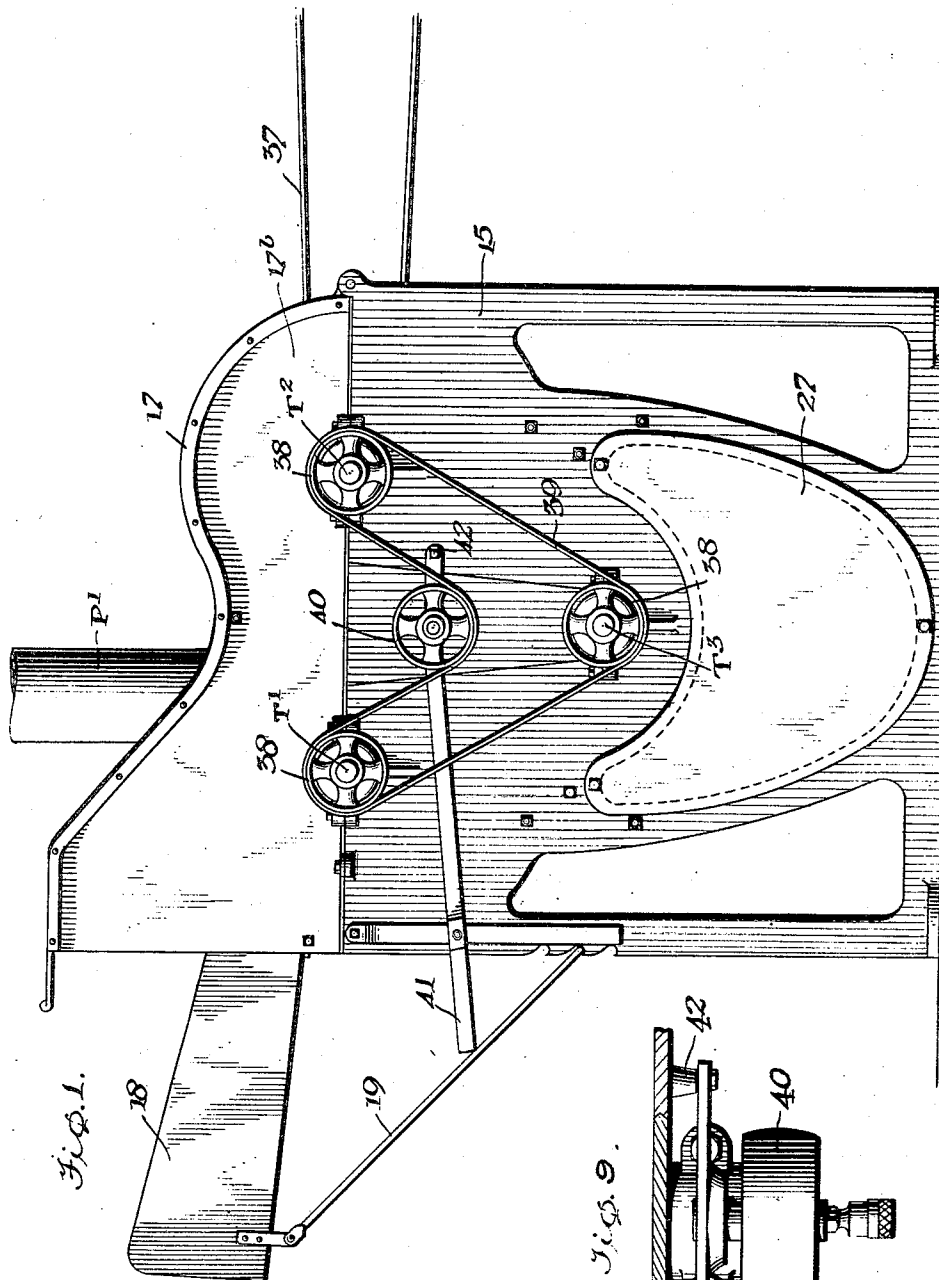
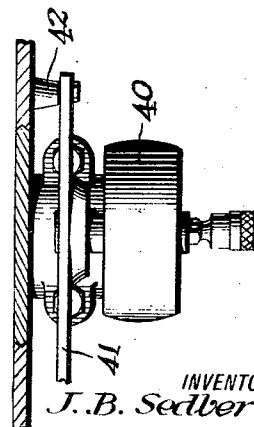


Fig. 9.



WITNESSES

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4 SHEETS—SHEET 2.

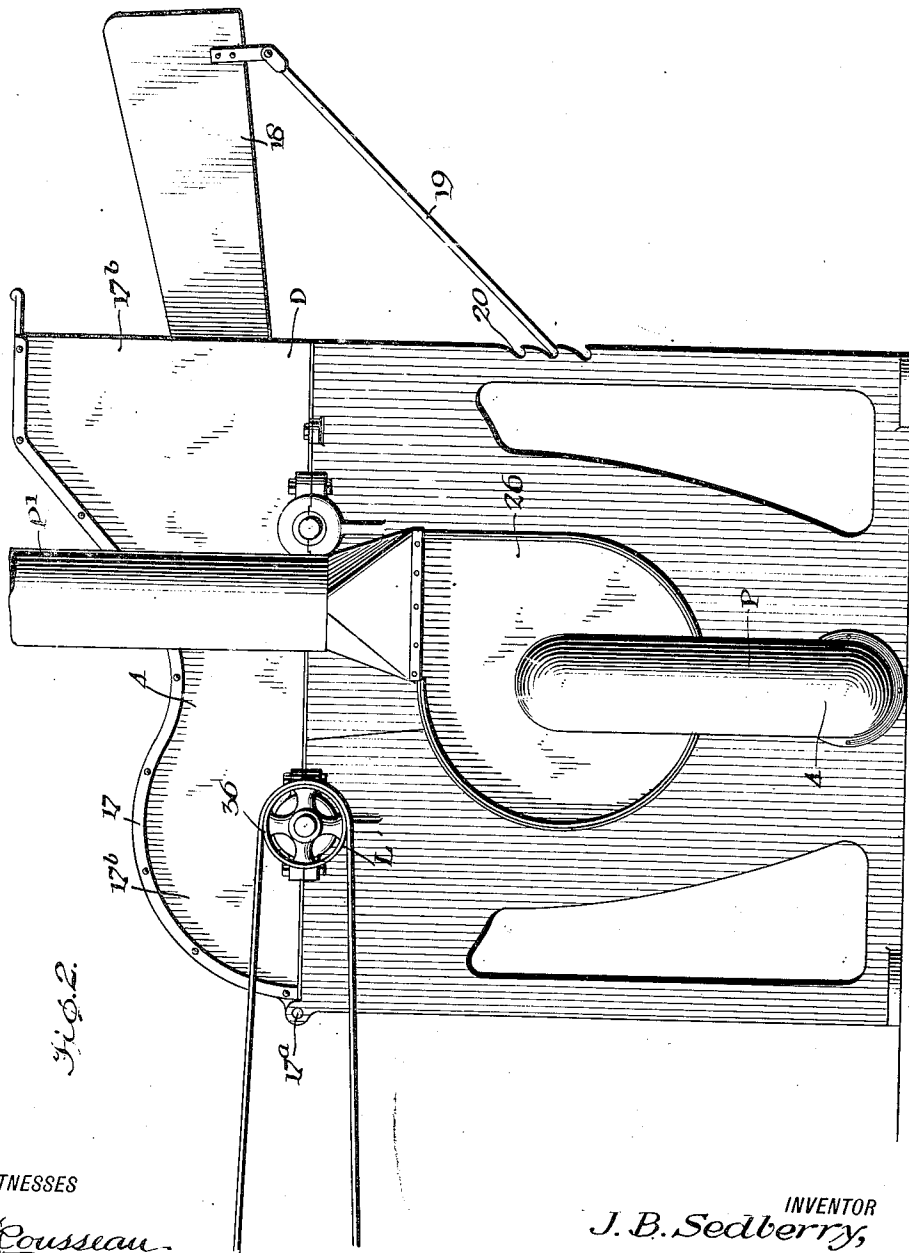


Fig. 2.

WITNESSES

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4 SHEETS—SHEET 3.

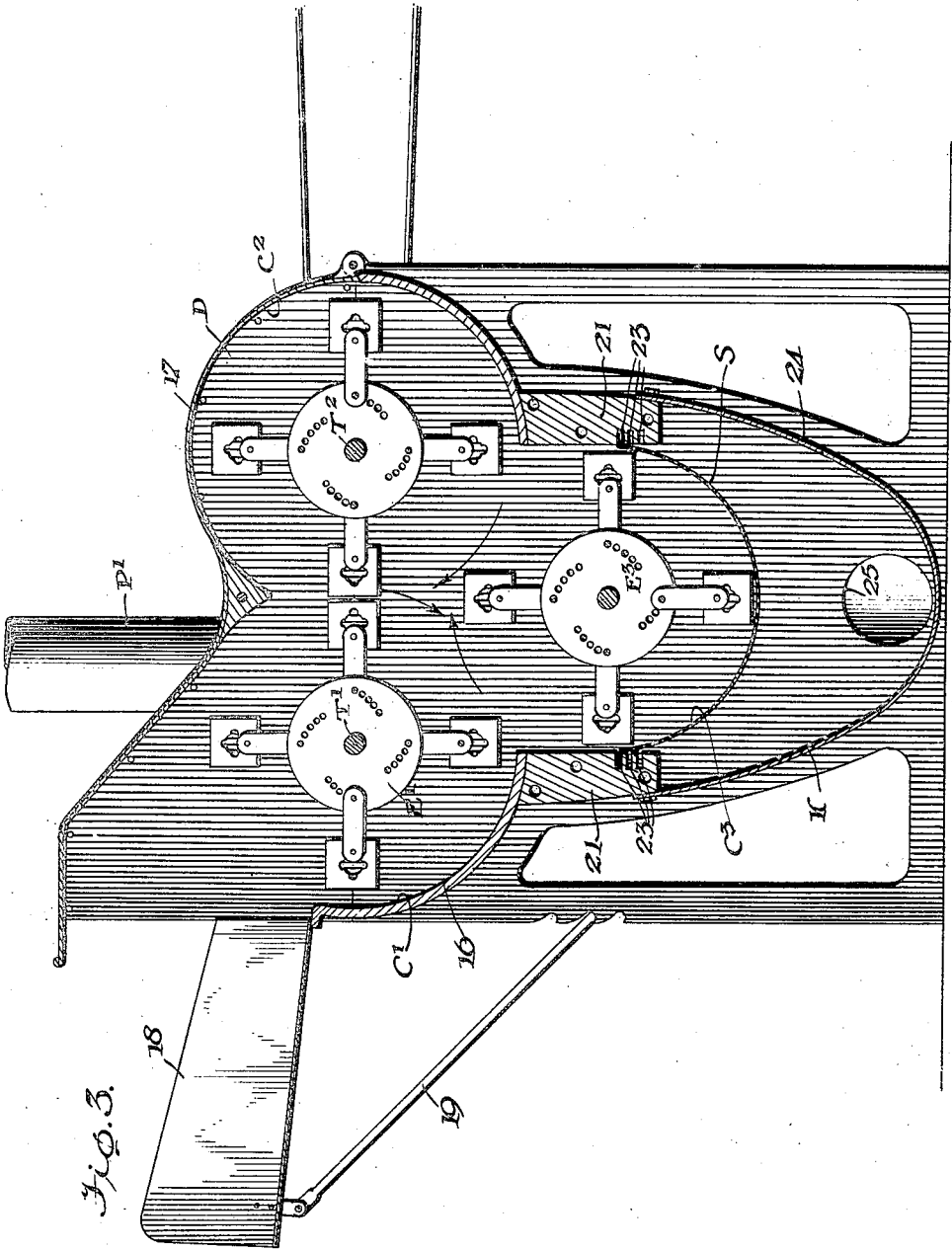


Fig. 3.

WITNESSES

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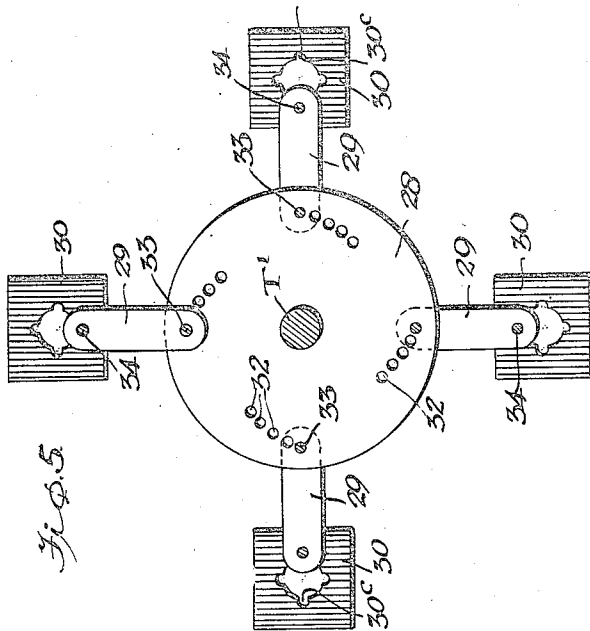


Fig. 5.

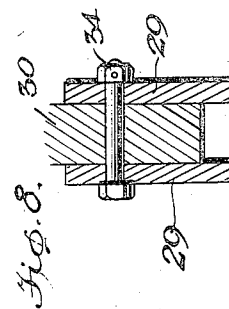


Fig. 8.

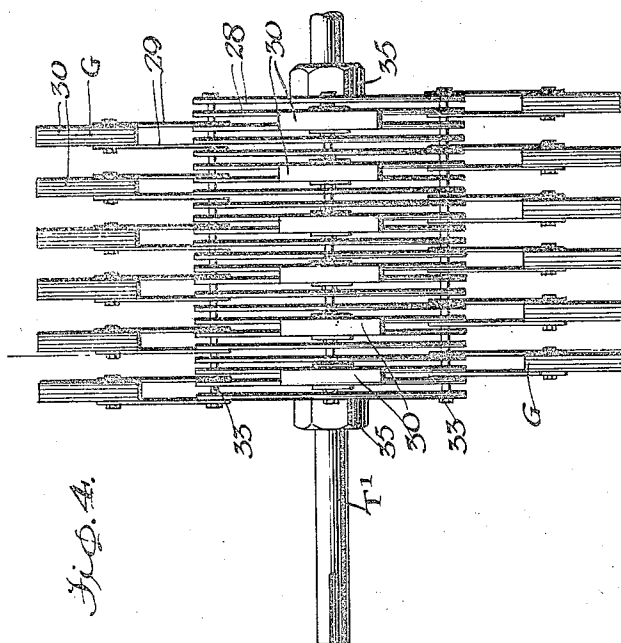


Fig. 4.

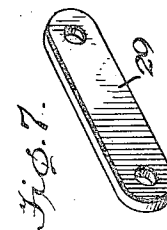


Fig. 7.

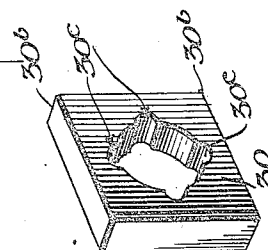


Fig. 6.

WITNESSES

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Patented Dec. 19, 1922.

1,439,581

UNITED STATES PATENT OFFICE.

JAMES BERNARD SEDBERRY, OF TEXARKANA, ARKANSAS.

GRINDING MILL.

Application filed December 8, 1920. Serial No. 429,140.

To all whom it may concern:

Be it known that I, JAMES BERNARD SEDBERRY, a citizen of the United States, and a resident of Texarkana, in the county of Miller and State of Arkansas, have invented certain new and useful Improvements in Grinding Mills, of which the following is a specification.

My invention relates to grinding mills of the character embodied in my co-pending application, Serial No. 378,771, filed May 4, 1920, and it contemplates certain improvements therein.

A purpose of my invention is the provision of a mill having rotatable grinding elements arranged in sets of three or more so as to cause a mutual coaction of the grinding elements of all the sets to effect a grinding of the material quickly and efficiently and with a minimum consumption of power.

It is also a purpose of my invention to provide a mill in which the grinding elements of each set are supported for adjustment with respect to the walls of the drum in which they are mounted to vary the grinding action of the elements, such elements being so mounted as to permit of the manual or automatic adjustment thereof circumferentially to present new grinding surfaces without detaching the elements from their supports.

I will describe one form of grinding mill embodying my invention and will then point out the novel features thereof in claims.

In the accompanying drawings:

Figure 1 is a view showing in side elevation one form of grinding mill embodying my invention.

Figure 2 is a view similar to Figure 1 showing the opposite side of the grinding mill.

Figure 3 is a vertical central longitudinal sectional view of the mill shown in the preceding views.

Figure 4 is an enlarged detail view showing in side elevation one set of grinding elements embodied in the mill shown in the preceding views.

Figure 5 is a view showing in end elevation one set of the grinding elements.

Figure 6 is a detail perspective view of one of the hammers.

Figure 7 is a similar view of one of the links.

Figure 8 is a fragmentary detail view, in section, illustrating the connection of a hammer to a pair of links; and

Figure 9 is a detail view, in plan, illustrating the belt tightener.

Similar reference characters refer to similar parts in each of the several views.

Referring specifically to the drawings and particularly to Figure 3, D designates generally a drum or casing which is formed in a manner to provide two upper compartments C' and C², and an intermediate lower compartment C³, all of the compartments communicating with each other at a common point. The drum or casing D consists of vertical side walls or castings 15 of a form to support the drum in its entirety as will be understood. The side walls 15 are connected by end walls 16, and a cover 17 which is hingedly connected as indicated at 17^a so as to allow the vertical swinging movement thereof in closing or opening the upper side of the drum. The cover 17 also includes side plates 17^b which are in effect a continuation of the side walls 15 and are adapted to be securely bolted to the latter. The end walls 16 and a portion of the cover 17 are of arcuate formation and are so arranged one with respect to the other as to provide the substantially circular compartments C' and C². The remainder of the cover 17 is of angular formation as clearly shown in Figure 3 and is spaced from the adjacent end walls 16 in a manner to provide a mouth through which the material to be ground is introduced into the drum. Adjacent this mouth is horizontally supported a chute 18 which is capable of being adjusted to various positions by means of a bracket 19 which can be moved to engage any one of a plurality of notches 20 formed in the adjacent edges of the side walls 15.

The compartment C³ is made up of a pair of blocks 21 secured between the side walls 15 and depending from the end walls 16 in the manner clearly shown in Figure 3. The blocks 21 are adapted to be connected to complete the lower side of the compartment C³ by an arcuate screen S which as shown in Figure 3 is provided at its longitudinal edges with laterally disposed flanges 22 which slidably fit within slots 23 formed in the blocks 21. In the present instance, I have provided a plurality of slots 23 arranged one above the other and at corresponding points within the confronting sides of the blocks 21 so

that the lowermost slot of one block will cooperate with the lowermost slot of the other block to receive the flanges 22 in supporting the screen S in proper position between the blocks. As the flanges are removably fitted within the slots, it will be clear that the screen can be removed from the blocks and inserted into other slots in effecting a vertical adjustment of the screen, for a purpose which will be hereinafter described.

Secured to the outer sides of the blocks 21 are the upper edges of a partition 24 which spans the space between the side walls 15 in a manner to provide a chamber K in which the ground material is deposited. The material is subsequently withdrawn from the chamber K through an opening 25 formed at one of the end walls 16, which communicates with a pipe P secured to this wall. The pipe P also communicates with a fan drum 26, while the latter communicates with a pipe P' through which the ground material is forced to a suitable point exteriorly of the mill.

The side wall 15 opposite to the side wall formed with the opening 25 is provided with a relatively large opening that is normally closed by a plate 27 as clearly shown in Figure 1. The plate 27 is bolted to the side wall in the manner shown so as to permit the ready removal thereof when it is desired to inspect or clean the interior of the chamber K.

Referring again to Figure 3, it will be seen that the compartments C', C² and C³ contain sets of grinding elements E', E² and E³ which are mounted for rotary movement on shafts T', T² and T³, respectively. As shown in Figure 3, each set of grinding elements E', E² and E³ are of identical construction so that a description of one will suffice for all. The construction of each set of grinding elements is clearly shown in Figures 6 and 7 wherein it will be seen that each grinding element is indicated at G and comprises a pair of supporting members 28, a pair of links 29 and a hammer 30. The supporting members 28 are in the present instance of disc formation and are maintained in spaced parallel relation upon the shaft S by a spacing ring 31. As shown in Figure 5, each supporting member 28 is formed at intervals on its marginal edge with sets of openings or perforations 32 which are arranged spirally with relation to the axis of the disc. The openings 32 of any one set are adapted to receive a pivot pin 33 upon which is mounted the inner ends of one pair of links 29, the links embracing the discs in the manner shown in Figure 4. The construction of each link is clearly shown in Figure 11. The outer ends of the links 29 are provided with a pivot pin 34 which extends through an opening

30^a formed axially within the hammer 30. This connection is clearly shown in Figure 12 which is a sectional view of the hammer 30 and the adjacent ends of the link 29. As illustrated to advantage in Figure 13, the hammer 30 is of rectangular formation and substantially flat so as to provide corners 30^b which function as grinding surfaces as will be more clearly described hereinafter. The wall of the opening 30^a is recessed at intervals of 90° as indicated at 30^c and in any one of these recesses the pivot pin 34 is adapted to normally repose when the grinding elements are rotating as will be more clearly described hereinafter. As shown in Figures 4 and 5, the hammers 30 are arranged in four groups that normally occupy 90° positions with respect to the supporting members 28, this arrangement permitting of the proper collapsing of the grinding elements when they are brought to rest and their movement to radial positions under the action of centrifugal force when they are rotated. The several supporting members 28 are secured to the shaft T' by means of nuts 35 that threadedly engage the shaft in a manner to embrace the outermost supporting members and to force the same toward each other so that the intermediate supporting members will be forced into clamping engagement with each other and thereby locked to the shaft for rotation therewith.

The mechanism for actuating the three shafts T', T² and T³ is clearly shown in Figures 1 and 2 wherein it will be seen that the shaft T² for the set of grinding elements E² is provided with a pulley 36 at one end, about which is trained a belt 37 that is adapted to be connected to any suitable source of power. The opposite end of this shaft is provided with a pulley 38, and similarly the adjacent ends of the shafts for the other two sets of grinding elements are provided with pulleys 38. Trained about these pulleys 38 is an endless belt 39 which can be tightened or loosened by a pulley 40 mounted on a lever 41 pivotally connected to the drum as indicated at 42. This connection and the manner in which the pulley 40 is supported upon the lever 41 is clearly shown in Figure 9, which is a plan view of these parts as will be readily understood. By actuation of the lever 41 it will be clear that the pulley 40 can be moved to tighten or loosen the belt 39 and to thereby connect or disconnect the shafts T² and T³ with or from the shaft T'. It is to be particularly noted that the manner in which the belt 39 connects the several shafts for the grinding elements causes rotation of all of the grinding elements in the same direction.

The operation of the grinding mill is as follows:

With the belt 37 rotating and the pulley 40 in such a position as to effect a positive

drive between the several shafts T', etc., it will be seen that the three sets of grinding elements are rotated in the same direction as indicated by the arrows in Figure 3. With the rotation of the grinding elements, the links 29 and the hammers 30 are thrown to radial positions under the action of centrifugal force, and maintain such positions as long as the shafts are rotating at the above predetermined speed. By referring to Figure 3, it will be seen that with the grinding elements rotating, and in extended position, the hammers of the grinding elements E' move in a direction opposite to the direction of movement of the hammers of the sets E² and E³ at the point at which the compartments C', C² and C³ communicate with each other. In other words, when the hammers of the set of grinding elements E' are moving downwardly, the hammers of the grinding elements E² are moving upwardly, while the hammers of the set E³ are moving substantially horizontally and in such direction as to oppose the movement of the hammers of both sets E' and E². In this manner, a coaction of the hammers of any one set with the hammers of the other two sets is effected to secure a most efficient grinding of any material introduced into the drum.

With the grinding elements now operating, the material to be ground is introduced into the compartment C' from the chute 18 and upon entering the compartment, such material is engaged by the hammers of the grinding elements E' and thus drawn into contact with the walls of the drum to effect a partial grinding of the material. Under the action of the rapidly rotating grinding elements, the partly ground material is projected forwardly into the compartment C² and downwardly into the compartment C³ thus being subjected to the action of the grinding elements of the sets E² and E³. During the passage of the material from the compartment C' to the compartments C² and C³, the hammers of all of the sets of grinding elements coact with each other to effect a further and greater grinding of the material, it being understood that because of the direction in which one set of hammers moves with relation to the other as previously described, the material is simultaneously engaged by the hammers of any two sets of grinding elements which effects a most thorough grinding of the material. In actual practice the major portion of the grinding is effected by this cooperation of the hammers, only a minor portion of the grinding being effected by the hammers coacting with the walls of the drum. When the material finally reaches the compartment C³, it is drawn to and through the screen S under the suction created by the fan operating in the fan drum 26. The mesh or perforations of the screen, of course, control the passage

of the ground material therethrough, so that those particles of the material which do not pass through the screen are retained upon the surface thereof under the suction created by the fan. These particles of material are divided into smaller particles by the action of the hammers 30 of the set E³ in passing rapidly over the surface of the screen so that ultimately all of the material is ground to the required degree of fineness to pass through the screen and ultimately out of the pipe P'. The grinding action of the hammers 30 of the set E³ can of course be varied by vertically adjusting the screen S in the manner previously described thereby varying the distance between the hammers and the screen. The slotted blocks 21 also permits of the use of screens of various meshes so that the desired degree of fineness to which the material is ultimately ground can be varied in accordance with the mesh of the screen inserted within the blocks.

During the operation of the mill, each hammer 30 maintains a definite position with relation to the links 29 so that only one corner or grinding surface 30^b is actively engaged in the grinding of the material. As will be understood from a consideration of Figure 3, the forward outer corner 30^b of each hammer performs the grinding operation, the other three corners being out of contact with the material and thus inactive. During continued use of the hammers, these corners become dulled so that it is necessary to adjust the hammers so as to displace the dulled corner with a sharp corner. This is effected either manually or automatically as will be understood from the following description: When the grinding elements are at rest, all of the links 29 occupy vertical positions with each of the pivot pins 34 disposed within a particular recess 30^c. Now when the shafts T', etc. start to rotate, the hammers in tending to maintain a definite position under the action of gravity cause certain of the pivot pins 34 to move into other recesses 30^c thus changing the adjustment of the hammer to present a new forward corner 30^b so that when the grinding elements have attained a certain speed, centrifugal force acts to maintain this adjustment during the rotation of the grinding elements. However, when the shafts T', etc., are again brought to rest, centrifugal force no longer acts upon the links 29 and the hammers 30 so that certain of the same drop from horizontal position to vertical position so that when the grinding elements are again rotated a new adjustment of the hammers will again be secured. In this manner an automatic adjustment of the hammers is effected to present new and sharp forward corners each time the machine is brought to rest and again set into operation. It will of course

be understood that certain of the hammers will fail to change their adjustment each time the machine is set into operation, but this may be readily overcome by the operator moving the hammers so that when the machine is started sharp forward outer corners will be presented.

Although I have herein shown and described only one form of grinding mill embodying my invention, it is to be understood that various changes and modifications may be made herein without departing from the spirit of the invention and the spirit and scope of the appended claims.

What I claim is:

1. A grinding element for mills, comprising a supporting member mounted for rotation, a hammer of angular form to provide a plurality of grinding surfaces, cooperating means between the hammer and the supporting member for positively holding the hammer in a predetermined position and against rotation relative to the supporting member when the supporting member is rotated while permitting the hammer to assume a different position when the supporting member is not rotated and positively maintain the hammer in this new position upon continued rotation of the supporting member whereby a different grinding surface is presented each time the supporting member is brought to rest and again rotated.

2. A grinding element for mills comprising, a supporting member mounted for rotation, links pivotally connected to the supporting member, and a hammer pivotally supported between said links, said hammer being of angular formation to provide a plurality of grinding surfaces and formed with an opening having the walls thereof recessed at intervals to receive the pivot of the hammer for the purpose described.

3. In a grinding element for mills, a hammer comprising, a body of angular formation having a circular opening formed axially thereof, with recesses in the walls of said opening.

4. In a grinding element for mills, a hammer comprising a body of angular formation having a circular opening formed axially thereof, with recesses in the walls of said opening at intervals of 90°.

5. A grinding element for mills comprising, a pair of discs having registering openings formed therein arranged in sets, with the openings of each set disposed spirally of the axis of the disc, links pivotally supported in any of said openings, a hammer comprising an angularly shaped body having an opening therein and recesses in the wall of the opening, and a pivot pin extending through said links and said opening and adapted to repose within any one of said recesses.

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