March 17, 1959 W. J. SACKETT 2,877,956

DUAL PURPOSE MILL

Filed Dec. 20, 1956

5 Sheets-Sheet 1

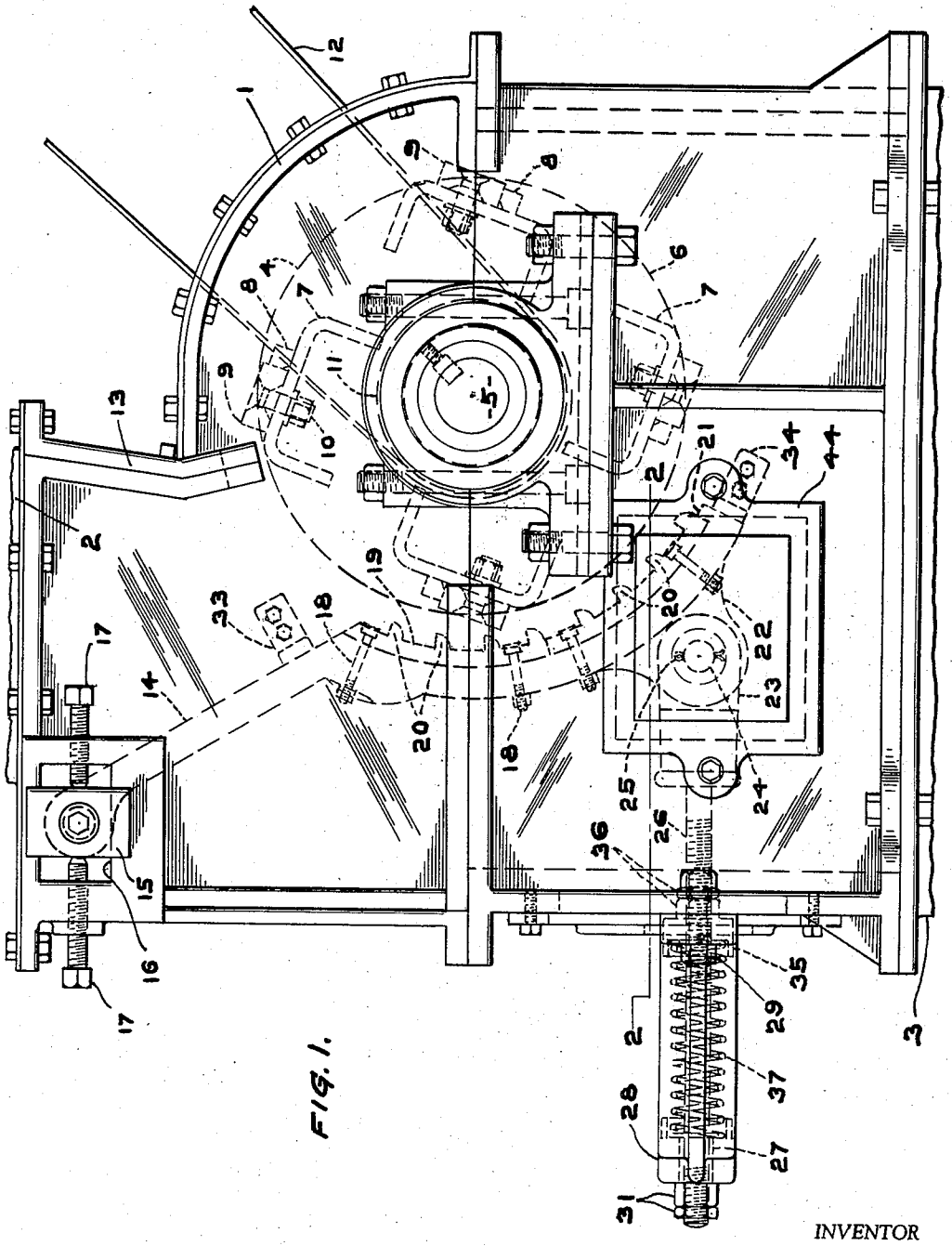


FIG. 1.

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5 Sheets-Sheet 2

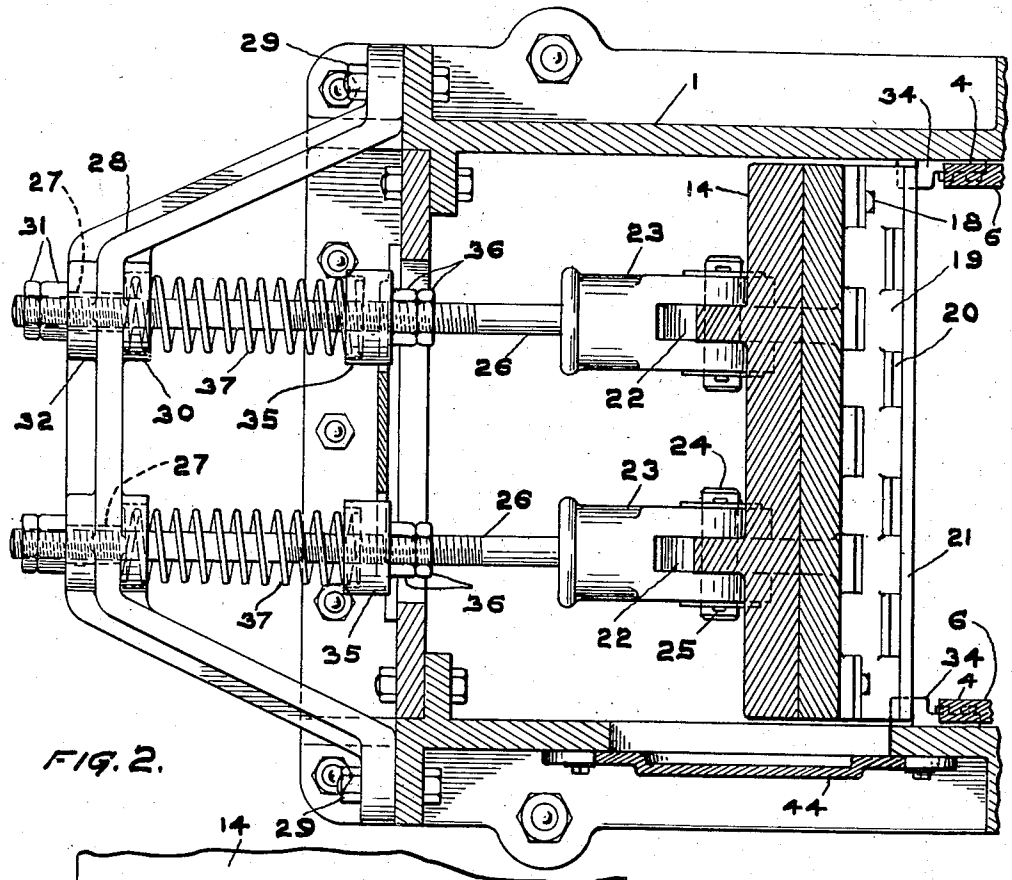


FIG. 2.

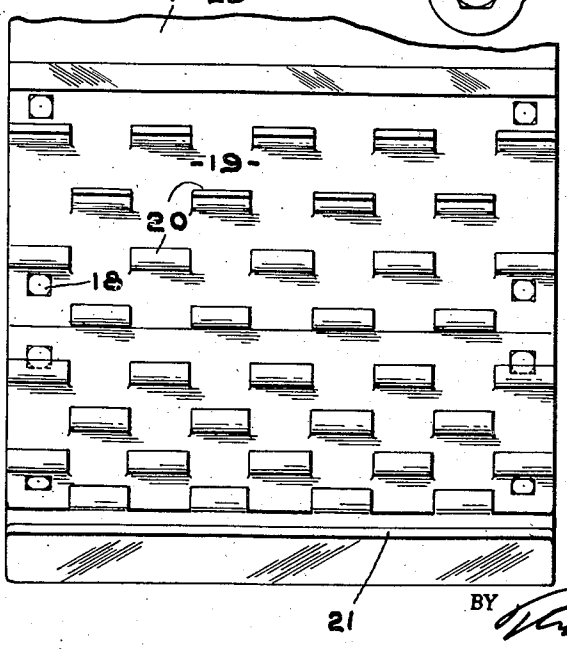


FIG. 3.

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DUAL PURPOSE MILL

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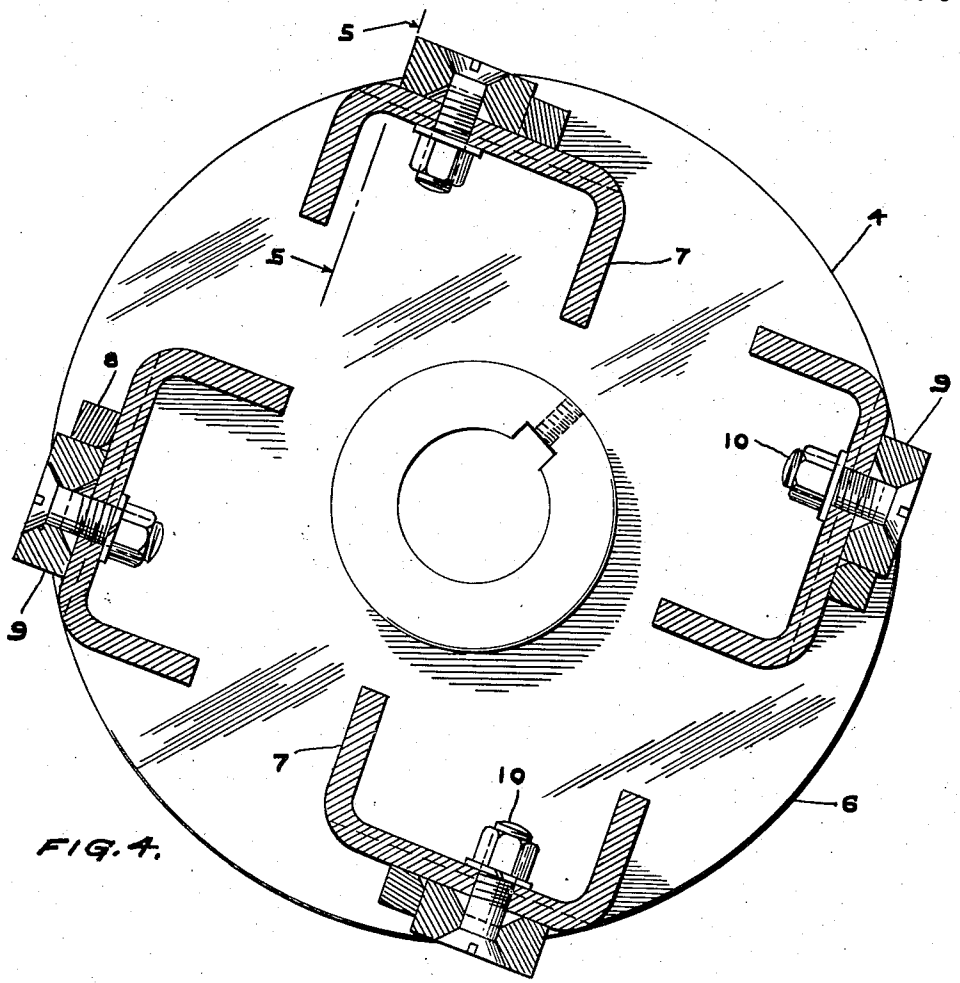


FIG. 4.

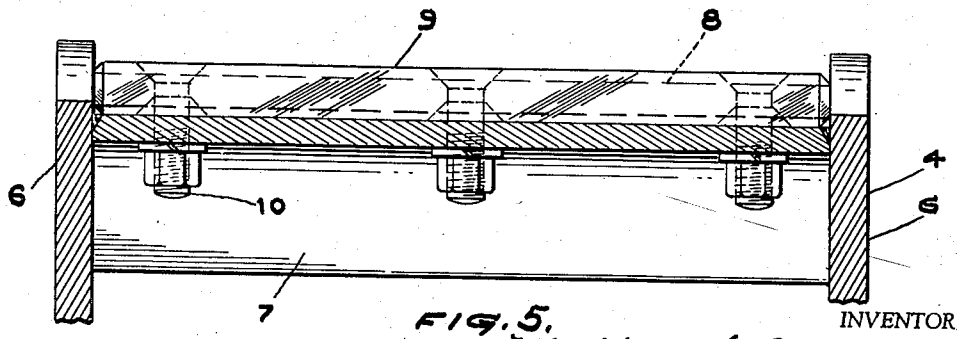


FIG. 5.

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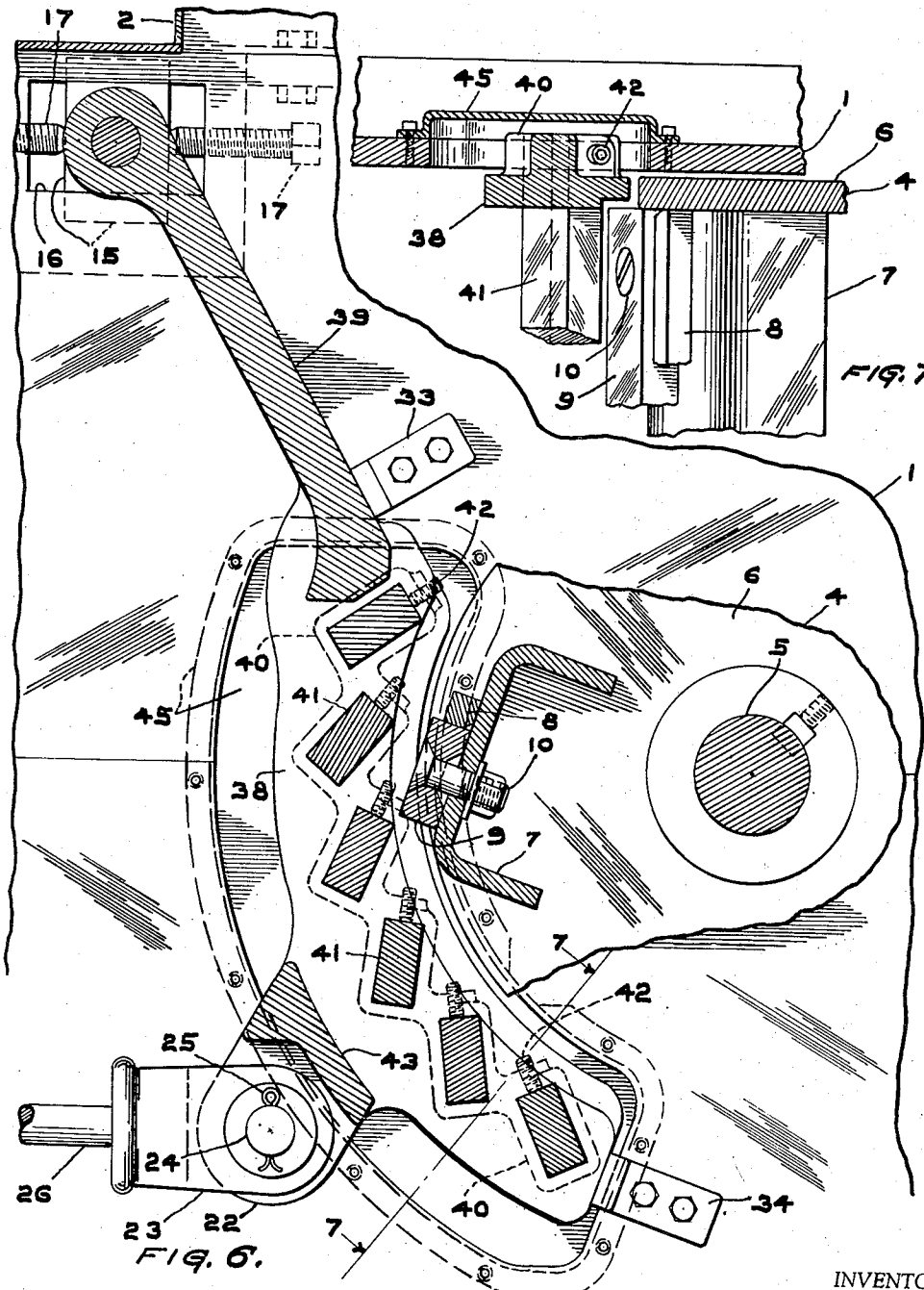


FIG. 7.

FIG. 6.

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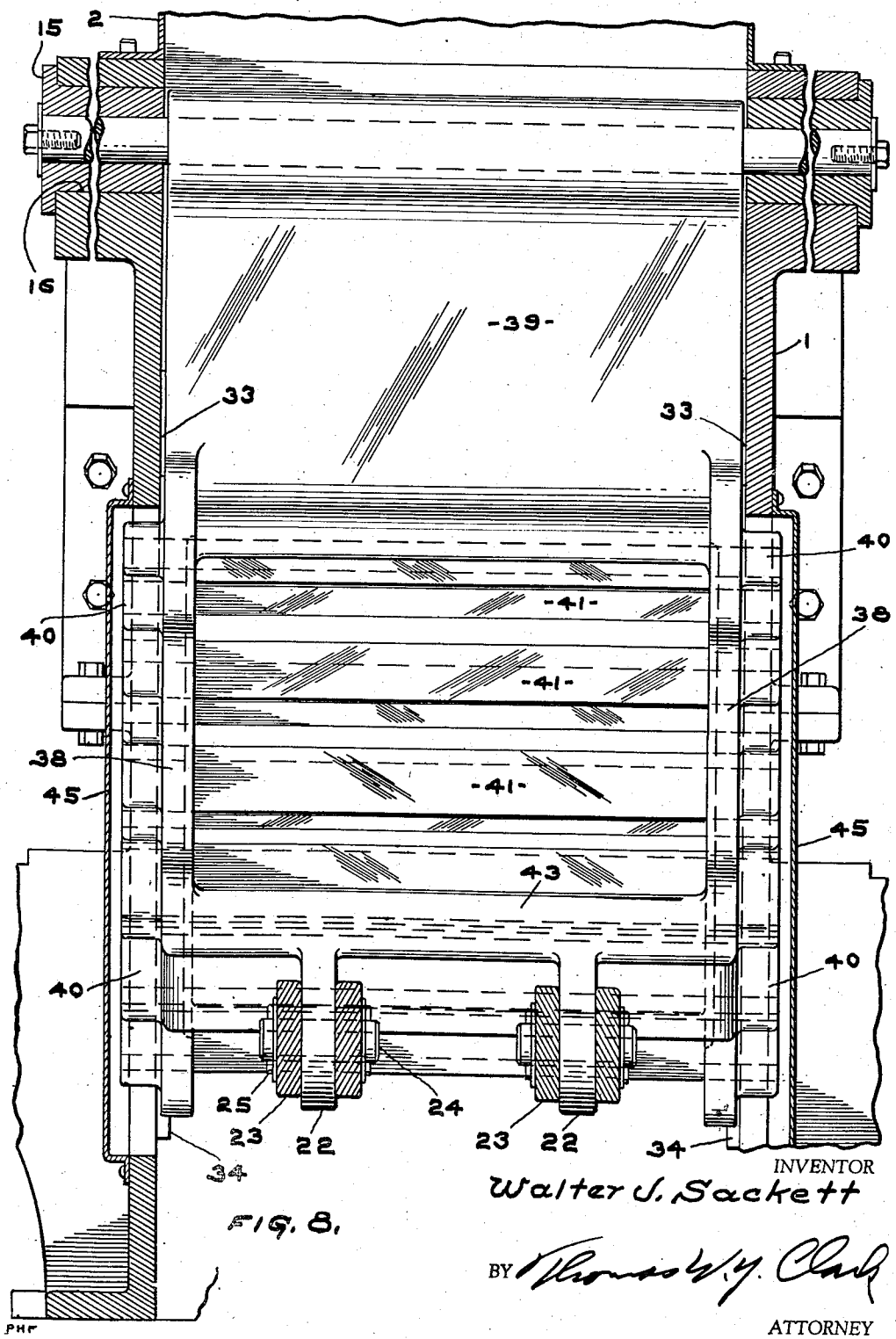


FIG. 8.

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United States Patent Office 2,877,956 Patented Mar. 17, 1959

2,877,956

DUAL PURPOSE MILL

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Application December 20, 1956, Serial No. 629,674

3 Claims. (Cl. 241—189)

This invention relates to an apparatus which may be called a dual purpose mill to be used in cracking hard pelleted types of materials where a minimum of fines is required, as well as for the pulverizing of products where a uniformly fine particle size is desired.

When used for the cracking purpose, this mill is employed in conjunction with a two surface screening equipment and an elevating means for returning the cracked material for further screen classification. The material passing through the first screen contains both fines and usable aggregate which is then passed through another screen for producing a desirable product by the removal of fines. The material that does not go through the first screen may be sent to the mill of the instant invention to be cracked and returned to the screening process again.

When used as a pulverizer, the mill of the instant invention is used in conjunction with a single surface screen in a manner similar to the flow above-described.

The mill of the instant invention has rectangular sectioned high carbon steel cracking and grinding members which may not only be replaced but in certain modifications of the invention they may be removed and turned over or turned end for end so that all sharp edges of the high carbon members may be utilized before requiring their replacement.

Another object of the invention is to provide a guide or apron member which can not only be held in a desired fixed position relative to the cracking rotor and with its lower portion concentric with the rotor, but which may be held resiliently in that position and which may also be sloped like a funnel with respect to the rotor so that larger particles may enter and be cracked or ground finer than if the stationary grinding member were continuously concentric with the rotor.

Other objects and advantages of the invention will be apparent from the following description and accompanying drawings forming a part hereof and in which:

Figure 1 is a side elevation of one modification of the invention.

Figure 2 is a horizontal sectional view on line 2—2 of Figure 1.

Figure 3 is a fragmentary elevational view of the stationary grinding member of this modification.

Figure 4 is a vertical sectional view of the rotor, without its shaft, showing the attachment of the grinding bars thereto.

Figure 5 is a sectional view on line 5—5 of Figure 4.

Figure 6 is a fragmentary vertical sectional view of another modification of the invention.

Figure 7 is a fragmentary sectional view of the modification of Figure 6 on line 7—7.

Figure 8 is a vertical sectional view of the second modification from the left side of Figure 6.

In the drawing similar numerals refer to similar parts throughout the several views.

The mill comprises the casing 1 which may be connected at its top and bottom to ducts 2 and 3, respectively, of a fertilizer or other kind of plant in which the mill is used. The casing has therein a rotor generally indicated at 4 which comprises a shaft 5 mounted on bearings outside the casing with heads 6 near each end thereof within the body of the casing. The heads 6 have welded therebetween the U-shaped members 7 which have their outer surfaces directed outwardly angularly to a radius from the shaft 5 and they have welded to their outward face holding members 8 against which the rectangular cracking bars 9 rest when affixed by the bolts 10 to the face of members 7. If a tangent were drawn to the circle formed by the outermost edge of the rectangular bars 9, it is preferred that the forward edge of the bars, in the direction of rotation of the rotor, have an angle of substantially 60 degrees to that tangent. That edge then throws the material toward the apron and its bars, as well as serving to crack the material more than crushing it, against the stationary bars, a shearing angle is presented to the material. The U-shaped members are welded to the heads 6 to give the above angle with the bars bolted fast to their outer flat faces, and the members at one of their outer corners are substantially tangent to the heads of the rotor as shown. The cracking bars 9 are made of high carbon steel and they are countersunk for the bolts 10 on both sides so that they may be turned over and also so that they may be turned end for end so that all four edges of the rectangular cracking members may be used before necessitating the replacement of these members. The rotor shaft 5 projects without the casing at both ends for its bearing mounting and it has affixed at one end a pulley 11 which may be driven by belt 12. The bars 9 are placed slightly back from the forward edge of members 7, and aggregate held on members 7 is carried to the stationary cracking member. Members 7 are spaced from each other, but because of the speed of the rotor, very little aggregate falls between the members.

The casing 1 has at the upper end thereof hopper 13 through which the material flows to the casing and rotor. The material is directed by the guide 14 which at its upper end is a straight apron extending from side to side of the hopper and it is pivotally mounted in blocks 15 which slide in ways 16 on both sides of the hopper and it is adjusted horizontally to and from the rotor and is held in its fixed position by set screws 17 on each side bearing on the blocks.

In the first form of the invention the guide 14 has a lower integral portion or rack concentric with the rotor and it has bolted thereon by bolts 18 sectional plates 19 having upwardly projecting teeth 20 thereon. The lower end of the guide has a stop shoulder 21 at its end against which the lower plate 19 bears, the upper plate bearing against the lower plate upper edge so as to make a rigid structure when the plates are bolted in place. It will be apparent that the plates may be removed and replaced when wear of the teeth 20 takes place. The lower portion of the guide 14 has lugs 22 thereon to which yokes 23 are attached by pintles 24 held in place by cotter pins 25. The yokes 23 have at their outer ends rods 26 which pass freely through openings 27 in the rear of bracket 28 bolted at 29 to the back of the casing 1. The rods 26 pass through cups 30 upon the inner side of the brackets 28 and nuts 31 rest against the outer bosses 32 on those brackets to limit the inward movement of the guide 14. Stop members 33—34 within the hopper also limit this inward movement. Cups 35 inwardly placed on the rods 26 are held by nuts 36 in place on these rods and between the cups 30 and 35 are compression springs 37. The location of the nuts 31 and 36 will determine the position of the lower end of the guide 14 and the tension on the springs 37 to

hold the guide in this fixed position. The springs permit yielding for unusually hard aggregate particles as well as in the event foreign unbreakable substances get into the mill like pieces of iron.

From this construction it will be apparent that the arc which is formed on the lower part of guide **14** concentric with the rotor may be tilted to make a larger opening adjacent the top of the rotor than the one at the bottom, a funnel-like opening, so that the aggregate initially entering may be larger and cracked or crushed finer before it leaves the arc of the stationary grinding member.

In the second modification of the mill the stationary grinding member rather than being solid at its lower arc end has sides **38** forming a rack integral with the upper apron-like portion **39** of the guide which is similarly mounted in blocks **15** and held in place by set screws **17**. The racks **38** are formed with outwardly projecting lugs **40** on their sides which form bearings for stationary grinding bars **41** which are likewise made of high carbon steel. They are held in place in the racks by set screws **42** and these stationary bars may be turned around or turned end for end to utilize all their edges in the cracking operation.

In this modification there is no danger of stoppage between the grinding surfaces on the stationary racks. Material falls between the bars. The same form of rotor is used for both modifications. In the second modification the racks **38** are joined by cross-member **43** having two rearwardly projecting lugs **22** thereon which are held in their desired position by yokes, rods and springs similar to those used in the first modification.

The casing **1** of the first modification has panel **44** on one side thereof which may be removed for ready access to the interior of the casing. Similar panels **45** may be removably affixed to both sides of the casing **1** for the second modification.

From this description it will be apparent that the cracking and pulverizing mill of this invention may be adjusted for either operation, the rotor preferably being speeded up when pulverizing is desired. Various modifications may be made in the construction of the mill without departing from the spirit of the invention.

What is claimed as new and is desired to be secured by Letters Patent is:

1. A cracking and pulverizing mill comprising a hopper, a horizontal rotor therein having thereon spaced heads and circumferentially spaced bar supports affixed to and extending between the heads, cracking bars on said supports, a rack in the hopper, pivot means parallel to and substantially above the rotor supporting the rack, the rack having a lower portion curved concentric with the rotor and having fixedly secured therein at their ends substantially spaced reversible cracking bars facing the rotor and having an upper apron portion sloped to direct material introduced to the hopper between the bars on the rack and those of the rotor, and means supporting the rack toward the rotor.

2. A cracking and pulverizing mill comprising a hopper, a horizontal rotor therein having thereon spaced heads, circumferentially spaced bar supports fixed at their ends to and between said heads, holding bars fixedly secured to the outer surface of said supports and cracking bars removably secured on said supports forward of and bearing against said holding bars, a rack in the hopper, pivot means parallel to and substantially above the rotor supporting the rack, the rack having a lower portion curved concentric with the rotor and transversely extending upwardly directed cracking teeth therein facing the rotor and having an upper apron portion sloped to direct material introduced to the hopper between the teeth and bars, and means supporting the rack toward the rotor.

3. In a cracking and pulverizing mill comprising a hopper, a horizontal rotor therein having thereon spaced heads, longitudinally U-shaped members affixed to and extending between the heads, their concavity being toward the axis of the rotor, cracking bars fixedly secured to the exterior of said members, a rack in the hopper, pivot means parallel to and substantially above the rotor supporting the rack, the rack having a lower portion curved concentric with the rotor and having fixedly secured therein at their ends spaced reversible cracking bars facing the rotor and having an upper apron portion sloped to direct material introduced to the hopper between the bars on the rack and those of the rotor, and means supporting the rack toward the rotor.

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