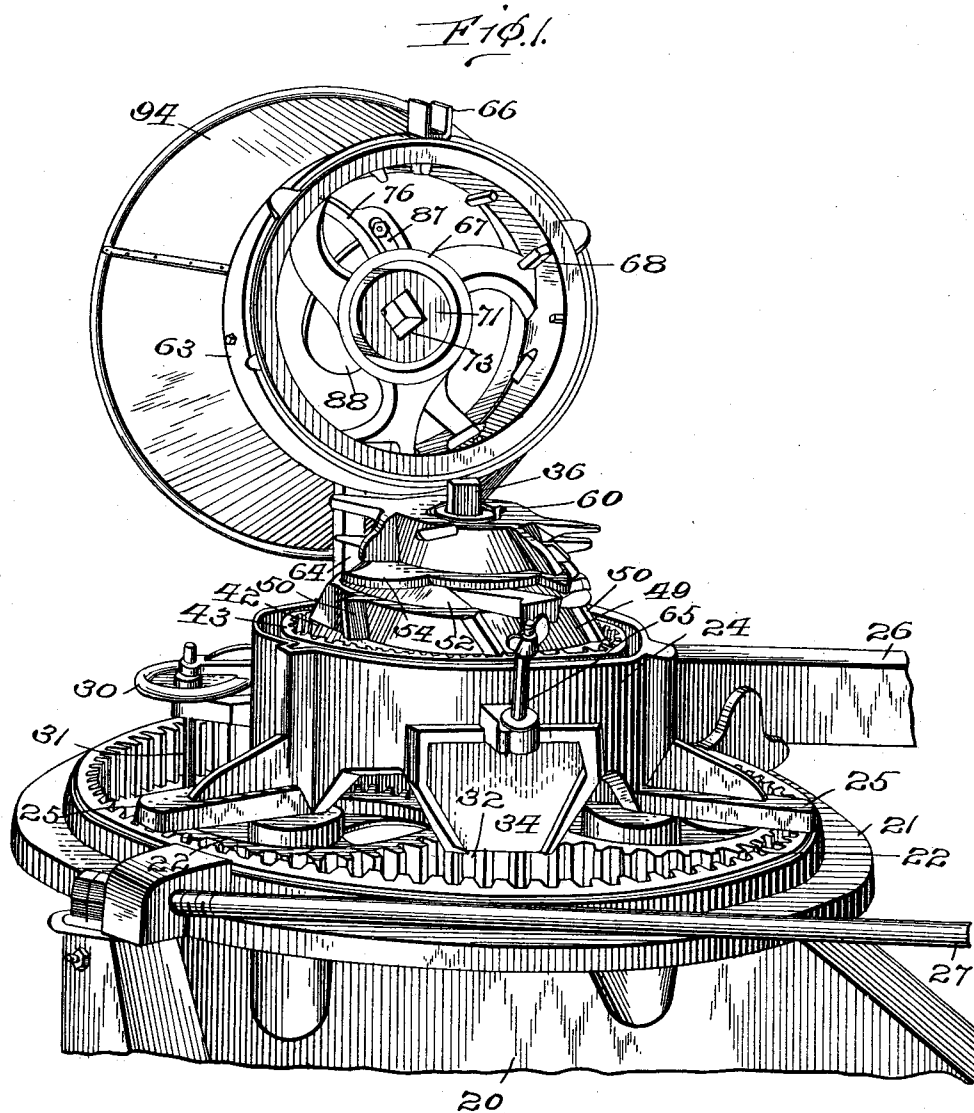


F. M. LYON.
GRINDING MILL.
APPLICATION FILED MAY 6, 1912.

1,063,810.

Patented June 3, 1913.

5 SHEETS—SHEET 1.



Witnesses
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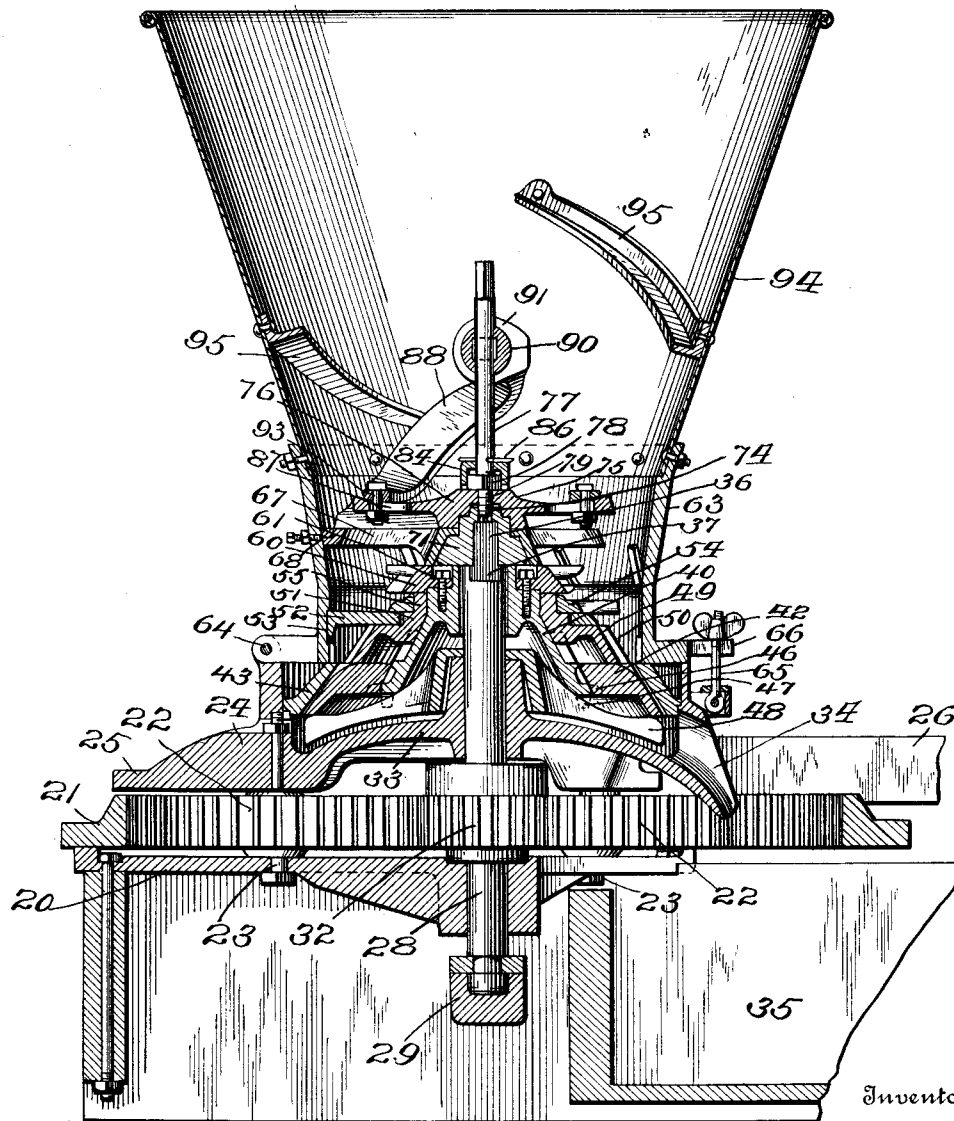
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5 SHEETS—SHEET 2.

Fig. 2.



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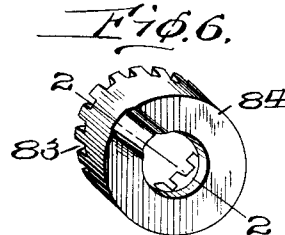
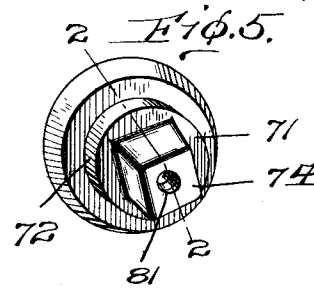
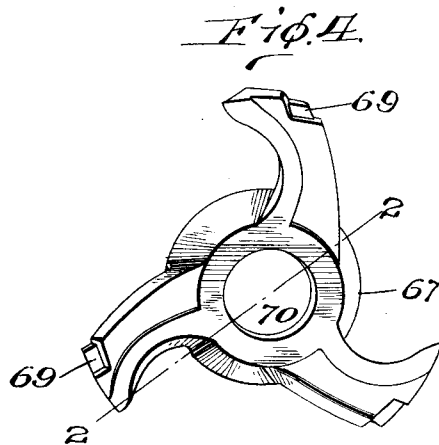
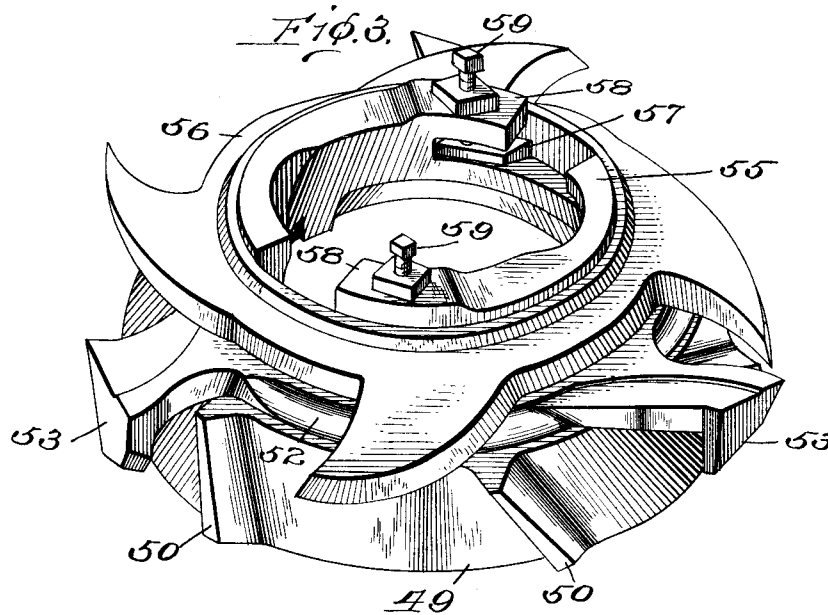
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5 SHEETS—SHEET 3.



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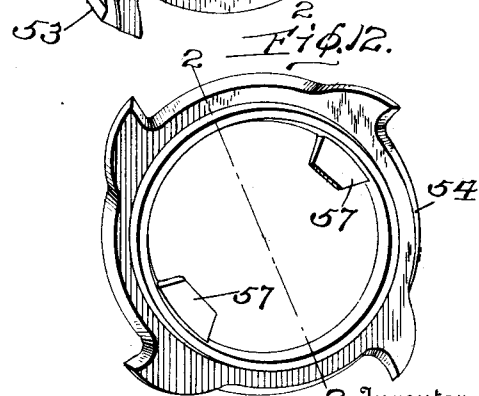
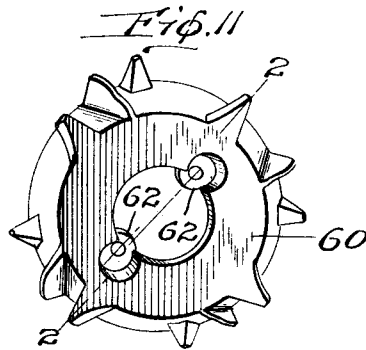
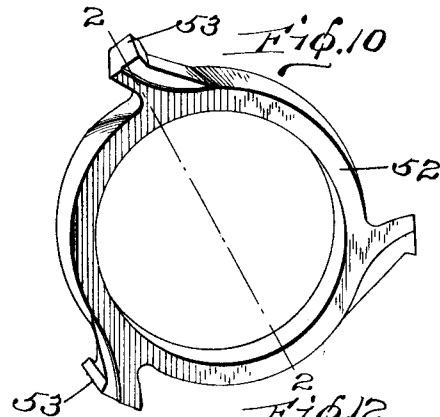
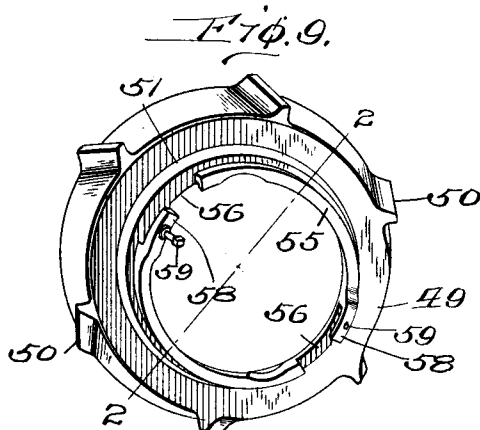
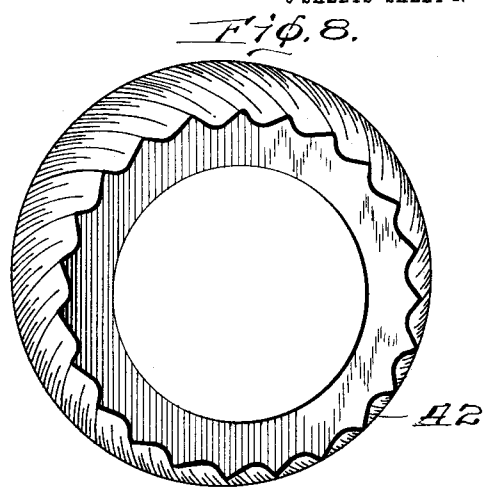
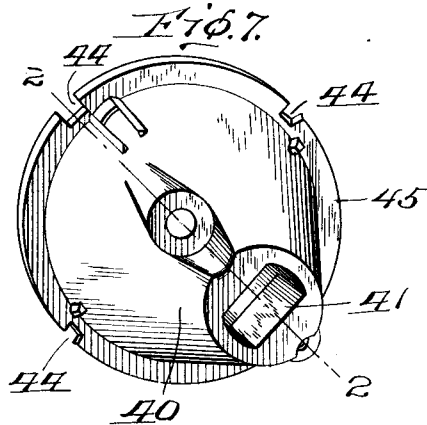
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5 SHEETS—SHEET 4.



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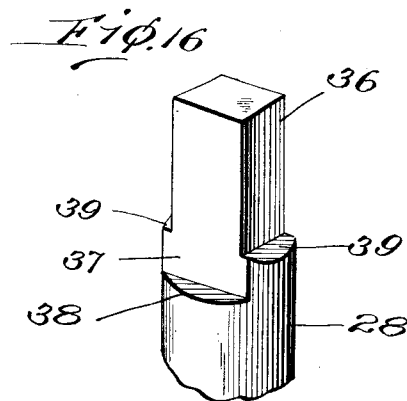
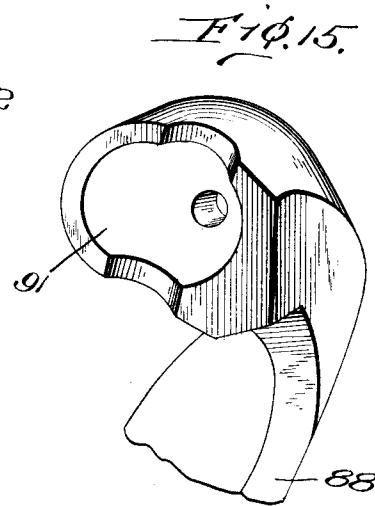
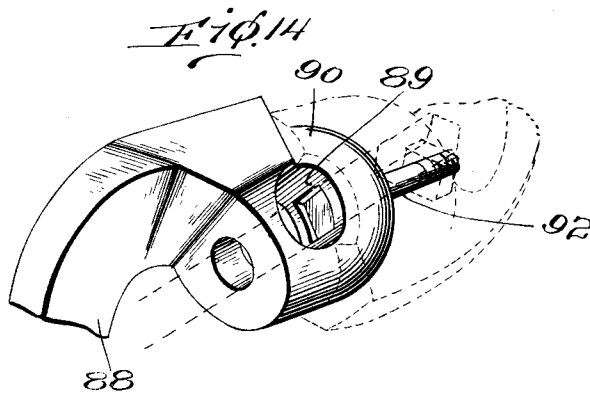
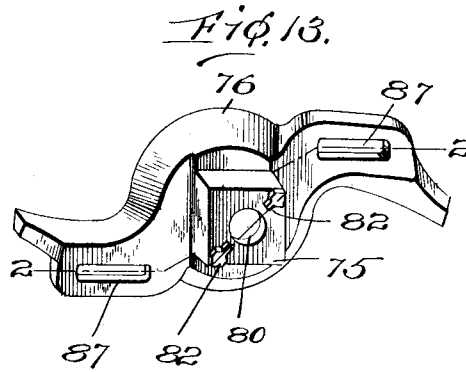
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5 SHEETS—SHEET 5.



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UNITED STATES PATENT OFFICE.

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GRINDING-MILL.

1,063,810.

Specification of Letters Patent.

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Application filed May 6, 1912. Serial No. 695,456.

To all whom it may concern:

Be it known that I, FRED M. LYON, a citizen of the United States, residing at Pontiac, in the county of Livingston and State of Illinois, have invented certain new and useful Improvements in Grinding-Mills; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to grinding mills and has for an object to provide a mill embodying improved features for cutting and grinding material, especially corn in the cob, corn in the cob with the husk on, and Kafir corn in the head.

A further object of the invention is to provide a mill having improved shears for cutting the material and with improved means for adjusting the shears to prevent the necessity of interfering with the adjustment when the shears are removed from the mill.

A further object of the invention is to provide, specifically, improved means for forcing the material contained in the hopper into the grinding part of the mill.

A further object of the invention is to provide a mill having a housing with shears rotating within the housing, such shears extending substantially to the inner periphery of the housing to leave no space between such housing and the extremities of the shears through which material may pass without being acted upon by the shears.

A further object of the invention is to provide in a vertical mill a plurality of independent cutting, grinding and shearing devices some of which are rotated and some of which are stationary, with the rotatable members rotated from a single vertical central shaft and providing means whereby the upper part of such shearing means may be lifted bodily from the extremity of such shaft.

A further object of the invention is to provide a single vertical central shaft with a cone mounted upon said shaft as a gimbal-joint, said cone carrying cutting, grinding and crushing devices capable of self adjustment by the tilting of the cone.

With these and other objects in view the invention comprises certain novel constructions, combinations and arrangement of

parts as will be hereinafter more fully described and claimed.

In the drawings:—Figure 1 is a perspective view of the improved mill with the hopper turned backwardly upon its hinge showing the major portion of the grinding elements exposed at the top of the housing and at the bottom of the inverted hopper. Fig. 2 is a vertical diametrical sectional view of the mill. Fig. 3 is a perspective view of the lower series of self-contained shears. Figs. 4 to 13 inclusive are respectively perspective views of the several cutting, grinding and shearing elements. Figs. 14 and 15 are perspective fragmentary views with the upper end of the force feed arrangement elements separated. Fig. 16 is a perspective view of the upper end of the driving shaft.

Like characters of reference indicate corresponding parts throughout the several views.

The improved mill which forms the subject matter of this application is adapted for being driven by any form of drive such as belt, gear or the like but is here shown as a sweep drive and as illustrated in the drawings of the present application comprises a base 20 with the bull-wheel 21 mounted thereon and confined to rotary orbit by a plurality of pinions 22 which said pinions are journaled upon the base by means of journal bolts 23. Above the bull-wheel the superstructure comprising the housing 24 is erected being supported upon the journal bolts 23 and comprising brackets 25 which extend outwardly over the bull-wheel 21 to hold the said bull-wheel from upward displacement.

To actuate the mill a sweep 26 is rigidly secured to the bull-wheel 21 and braced in the usual manner as by the brace 27.

Centrally of the bull-wheel and equidistant between the journal bolts 23 a central drive shaft 28 is journaled in the base supported by a bearing lever 29 and adjusted by the handwheel 30 and screw bolt 31 in substantially the usual and ordinary manner of adjusting grinding burs in grinding mills. The shaft 28 has a pinion 32 splined thereon which said pinion is intergeared with and receives motion from the pinions 22. It will therefore be apparent that as the sweep 26 is rotated by any ordinary motive power the bull-wheel 21 is rotated, ro-

tating therefrom the pinions 22, the pinion 32 and the shaft 28 which rotates in its bearing in the lever 29. The shaft 28 extends upwardly through the convex bottom 33 of the mill which said bottom terminates in a discharge spout 34 at one side for the discharge of the ground material through the bull-wheel 21 between the pinions 22 into a receptacle 35. At its upper end the drive shaft 28 is provided with a squared portion 36 below which is a larger angular portion 37 the latter terminating in a shoulder 38 while the squared portion terminates in shoulders 39. Upon the angular portion 37 and seated upon the shoulders 38 is a cone shaped member 40, shown in perspective in Fig. 7, which said cone shaped member is provided with an opening 41 in its apex proportioned to fit loosely over the angular portion 37 of the shaft and to be rotated therewith forming a gimbal joint for self adjustment. The cone shaped member 40 is the member to which the greater part of the grinding, shearing and crushing members are attached and which forms the rotating base for carrying such members, the gimbal joint permitting the members to adjust themselves as the shaft 28 rotates. The first of the rotatable parts carried directly by the cone is the grinding ring or bur 42 shown in perspective in Fig. 8, which operates inside of and in the usual spaced relation to the opposing ring 43 which is of substantially the usual and ordinary construction. The grinding rings 42 and 43 comprise the means for completing the grinding of the material the disintegration of which is begun by the shearing, cutting and crushing devices above and which will be hereinafter more fully described. The grinding ring 42 is carried by the cone 40 by providing the cone 40 with notches 44 formed in the flange 45 at the base of said cone and the grinding ring 42 provided with lugs 46 engaging in said notches 44. The base of the cone is also provided with lugs 47 downwardly extending and engaging and rotating a spider 48 which serves to move the ground material about upon the convex floor 33 to discharge the same by centrifugal force or by pressure from above through the spout 34.

Next above the grinding ring 42 a force ring 49 is carried, such force ring being shown in perspective in Fig. 9. The force ring is provided about its periphery with a plurality of inclined force ribs 50 which when rotated tend to crush, reduce and force material into and between the grinding rings 42 and 43. The force ring 49 is provided with an annular upstanding rib 51 upon which is located the stationary shear member 52, shown in perspective in Fig. 10. The position of the stationary shear member 52 is such that the force ring 49 may rotate without rotating such shear member,

which shear member is provided with lugs 53 engaging in furrows in the inner periphery of the housing 24, as shown particularly in Fig. 2. The engagement of this shear ring in the furrows of the housing prevents such shear ring from rotating and permits the superposed shear ring 54, shown in perspective in Fig. 12, to rotate upon and in contact with the upper surface of the stationary shear ring 52. The force ring 49 is provided with a second annular rib 55 interrupted at 56 on opposite sides, particularly as shown in Fig. 9, and the shear ring 54 is provided with lugs 57 adapted to pass through the interrupted portions of the rib 55 and engage under overhangs 58. The overhangs 58 are provided with set screws 59 which are applied upon the lugs 57 of the shear ring 54 to adjust the said ring 54 more or less tightly relative to the stationary shear ring 52. It will be noted especially from Fig. 3 that the force ring 49, stationary ring 52 and rotating shear ring 54 may be removed bodily from the mill without interfering with the adjustment of the shear 54 by the set screws 59. In mills containing shear mechanism it is found necessary upon removing the mechanism from the mill proper to remove the units of the shear devices separately and when the same are returned to the mill it is a matter of considerable difficulty to secure the proper adjustment of the shear. By the arrangement of the parts in an organized structure as shown in Fig. 3 all may be removed from the mill as such structure without in any way interfering with the desired adjustment.

Upon the top of the cone 40 a breaking and crushing member 60, shown in perspective in Fig. 11, is employed, such crushing member being secured to the cone by means of screws 61 inserted through ears 62, such ears being shown in Fig. 11, and the bolts being shown in Fig. 2.

The parts enumerated are the parts which are carried by the shaft 28 within the housing 24. Above the housing 24 a body 63 is hinged at 64 and held in position by means of a bolt 65 engaging spaced lugs 66. Within the body 63 a shear spider 67, shown in perspective in Fig. 4, is employed such shear member being stationary and connected with the inner periphery of the body 63 by means of lugs 68 formed therein under which the shouldered extremities 69 of the said shear spider 67 engage. The shear spider 67 is provided with a large central opening 70 in which is mounted a cap 71, shown in perspective in Fig. 5, said cap having an annular shoulder 72 to permit the said cap to rotate within the opening 70 of the spider and provided upon its under side with a squared socket 73 proportioned to engage the upper squared end 36 of the shaft 28 and to be rotated thereby. Upon its up-

per side the cap 71 is provided with a squared shank 74 proportioned to engage in the squared socket 75 of the shear spider 76, shown in perspective in Fig. 13, and
 5 such spider is retained thereon by means of a bolt 77 having a nut 78 rigidly secured upon said bolt and with its screw threaded extremity 79 inserted through the central opening 80 of the spider 76 and engaged
 10 in the screw threaded opening 81 of the cap. By applying a wrench to the squared part 78 the bolt 77 may be rotated so that the threaded extremity 79 exerts tension upon the shear spider 76 by the nut 78
 15 bearing upon the top of such spider.

To cover the squared part 78 and prevent it from catching the material acted upon as well as prevent the part 78 being rotated to interfere with the adjustment, the upper
 20 side of the socket 75 is provided with lugs 82 which are engaged by the serrated edge 83 of a cover 84 shown in perspective in Fig. 6. The cover 84 is provided upon its upper side with a radial furrow 85 and a
 25 cotter pin 86 is inserted through the bolt 77 and engaged in the furrow 85 to prevent the cover 84 from becoming disengaged from the lugs 82 of the spider 76. By this arrangement the cover 84 which engages the
 30 nut 78 prevents the said nut 78 and bolt 77 from rotating to interfere with the adjustment of the shear device composed of the shear spiders 76 and 67.

The shear spider 76 is provided in its
 35 arms with slots 87 which engage the lower extremities of the adjustable forcing worm members 88. One of the worm members 88 is provided at its upper end with a hole 89 adapted to embrace the bolt 77 and provided upon one side with a convex engaging
 40 surface 90. The other force worm member 88 is provided at its upper end with a concave head 91 proportioned to fit over the convex surface 90 and with a bolt 92 passing through the head 91 to permit the two
 45 members 88 of the worm to be adjusted. The lower ends of the worms engage the slots 87 and the adjustment secured is retained by bolts 93, shown particularly in
 50 Fig. 2.

Above the body 63 a hopper 94 is erected having spiral ribs 95 secured therein which coact with the force worm members 88 so that as the latter revolve carried by the
 55 shear spider 76 the action is to force the material contained in the hopper down into position to be engaged first by the shear comprising the members 76 and 67, next into position to be engaged by the breaking
 60 and crushing member 60, then to the shears composed of the members 52 and 54, then to the force ring 49 which forces the material into and between the grinding rings 42 and 43.

65 Especial attention is invited to the fact

that the shears above referred to are provided with such shearing blades as extend substantially to the very wall of the interior of the housing and body. By the arrangement of the shears of such diameter it is
 70 possible to prevent the passage of any material about the ends of the shear blades without being acted upon by such shears. By the adjustability of the force worms 88 a greater or less amount of power or forcing
 75 action can be applied to the material therein, depending upon the material being ground as well as other circumstances connected with and surrounding the manipulation of such material.

As will be noted from Fig. 1, the hopper with the body may be turned backwardly upon the hinge carrying therewith the upper shear and the force worm and exposing for access the crushing member which when
 80 removed permits the ready and convenient removal of the self-contained shear structure below both without disturbing in any manner the adjustment already secured upon the upper or lower shears. By this
 85 arrangement the outer and inner grinding rings are almost immediately accessible so that either or both may be removed in a very few moments after the hopper has been turned back to the position shown in Fig. 1.

I claim:—

1. In a grinding mill, a central shaft, a shear mechanism comprising engaging members, means to rotate one of said members, means to retain the other of said members
 100 against rotation, means to adjust the tension of one shear on the other, and means permitting the removal of the shear structure without interfering with such adjustment.

2. In a grinding mill, a housing, a central driving shaft journaled in the housing, a shear member engaging the housing to prevent such member from rotating, a second shear member carried by and rotating
 110 with the shaft, means to exert tension of one shear upon the other, and means permitting the removal of both shears from the housing without disturbing the tension.

3. In a grinding mill, a housing, a power shaft journaled centrally within the housing, a force ring carried by the shaft, a shear member disposed upon the force ring, means carried by the housing for engaging the shear member to prevent its rotating, a second shear member disposed upon the first
 120 mentioned shear member, means carried by the force ring for exerting tension upon the second mentioned shear member to adjust the said shear member relative to the first mentioned shear member, and means whereby the force ring and the two shear members may be removed from the housing without varying the tension of the shear members.

4. In a grinding mill, a housing, a shaft 130

5 journaled to rotate vertically within the housing, a cap removably carried upon the upper extremity of the shaft, a shear member embracing the cap and held against rotary motion, a second shear member carried by and rotating with the cap, means to exert tension between the shear members, and means to remove the cap from the shaft without varying the tension between the shear members.

10 5. In a grinding mill, a housing, a shaft journaled vertically within the housing, a body hinged upon the housing, a shear member rigidly carried by the body and held against rotation, a cap mounted to rotate within the shear member and provided with means for engaging with and being rotated by the shaft, a second shear member carried and rotated by the cap, and means to vary the tension between the shear members.

20 6. In a grinding mill, a body, a shaft journaled to rotate vertically within the body, a shear member carried by and rotating with the shaft, force worm members carried by the shear member, and means to adjust the force worm members radially upon the shear member.

25 7. In a grinding mill, a body, a shaft journaled to rotate centrally within the body, a shear member carried rigidly by the body and held against rotation, a second shear member mounted upon the first mentioned shear member, means forming connection between the shaft and the second shear member, force worm members carried by the second mentioned shear member and extending upwardly above the body, and means to adjust the worm members radially upon the shear member.

8. In a grinding mill, a housing, a body 40 hinged upon the housing, a shear mechanism carried by the housing, means carried by the body when in closed position to engage one of said shear members and hold such shear members against rotation, means 45 to remove the shear mechanism from the body and housing as an organized structure, a second shear mechanism carried by the body and movable therewith, and means connecting the movable members of the two 50 shear mechanisms to be driven from a single power shaft.

9. In a grinding mill, a housing, inclined ribs formed in the interior of the housing, a power shaft journaled centrally within 55 the housing, a force ring carried by the shaft, a shear member disposed upon the force ring, the said ribs being interrupted at the point of passage of the shear member, means carried by the housing for engaging the shear member to prevent its rotation, a second shear member disposed upon the first shear member, means carried by the force ring for exerting tension upon the second mentioned shear member to adjust 65 said shear member relative to the first mentioned shear member, and means connecting the force ring and the two shear members whereby the structure may be removed from the housing as a unit without varying the 70 tension of the shear members.

In testimony whereof I affix my signature in presence of two witnesses.

FRED M. LYON.

Witnesses:

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