

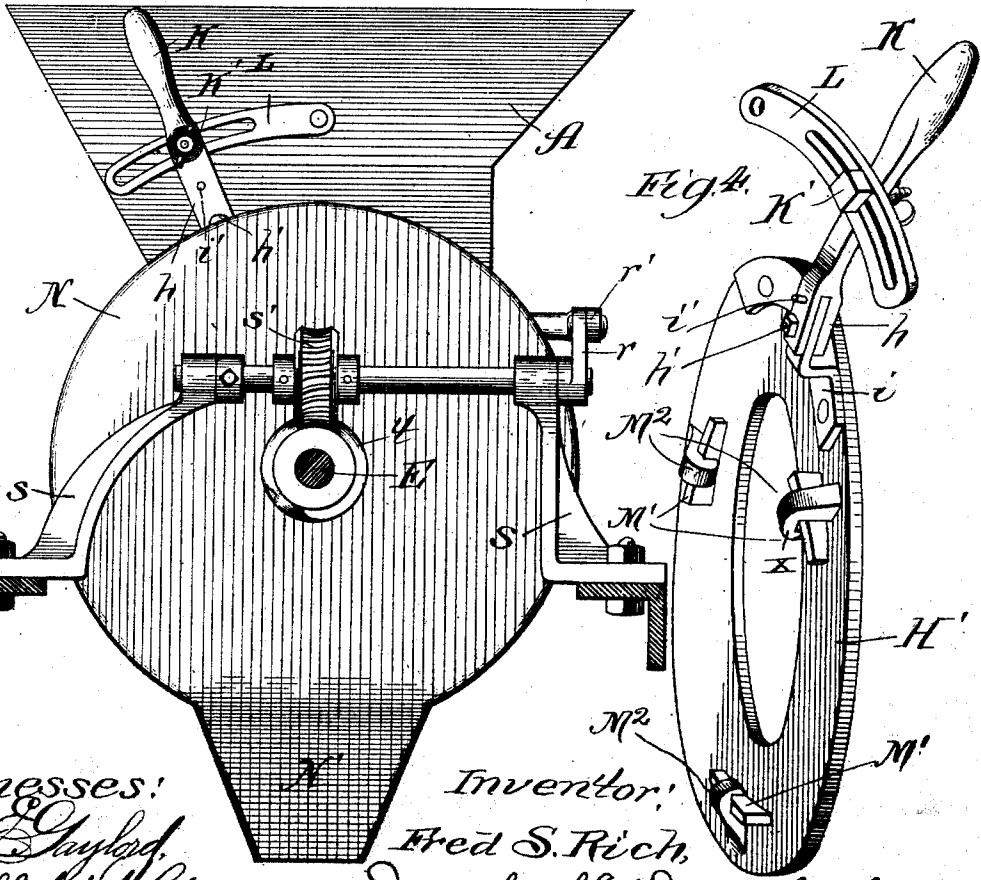
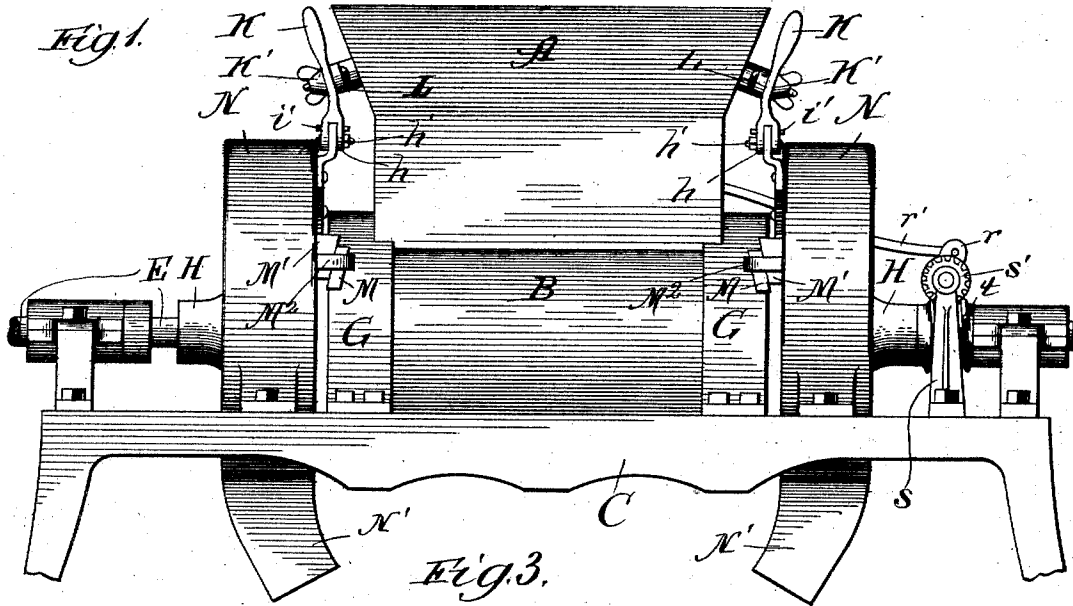
(No Model.)

4 Sheets—Sheet 1.

F. S. RICH.
CORN AND COB CRUSHER AND GRINDER.

No. 503,357.

Patented Aug. 15, 1893.



Witnesses:
Clifford White
Clifford White

Inventor:
 Fred S. Rich,
 By *Dyrenforth and Dyrenforth,*
Attys.

(No Model.)

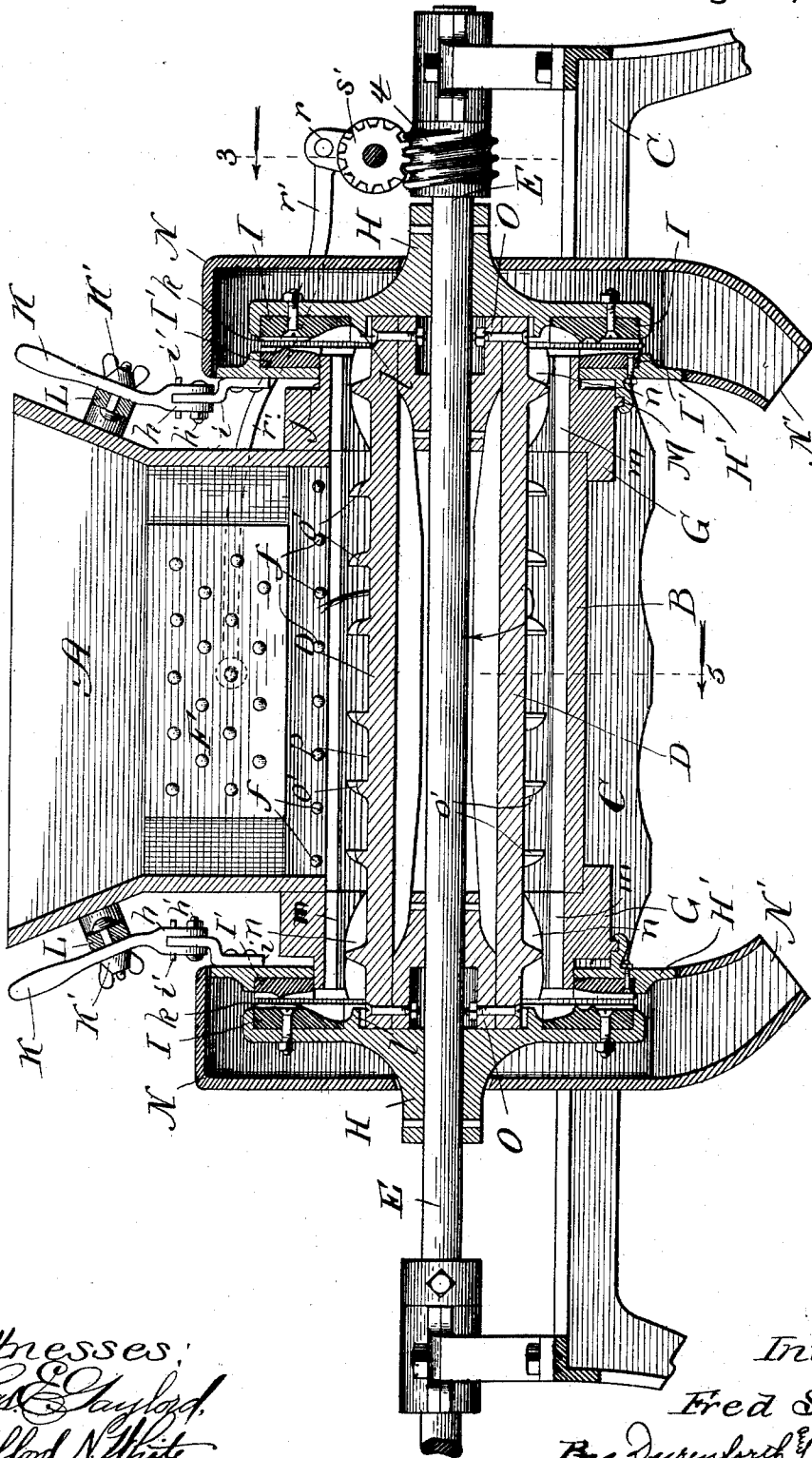
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FIG. 2.



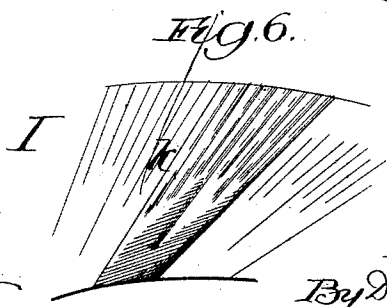
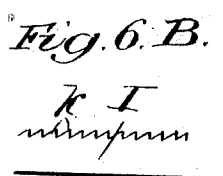
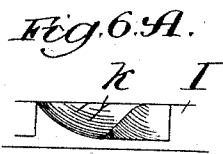
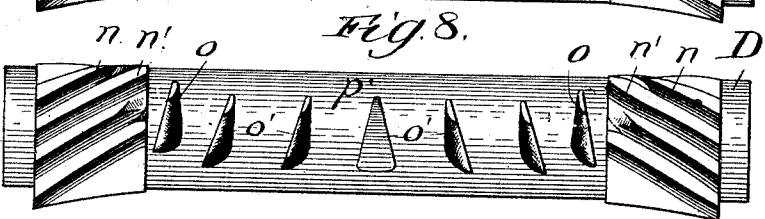
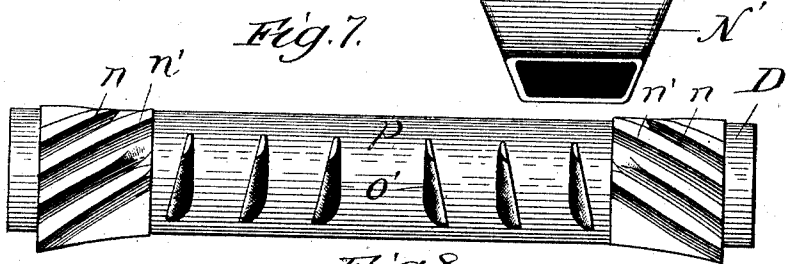
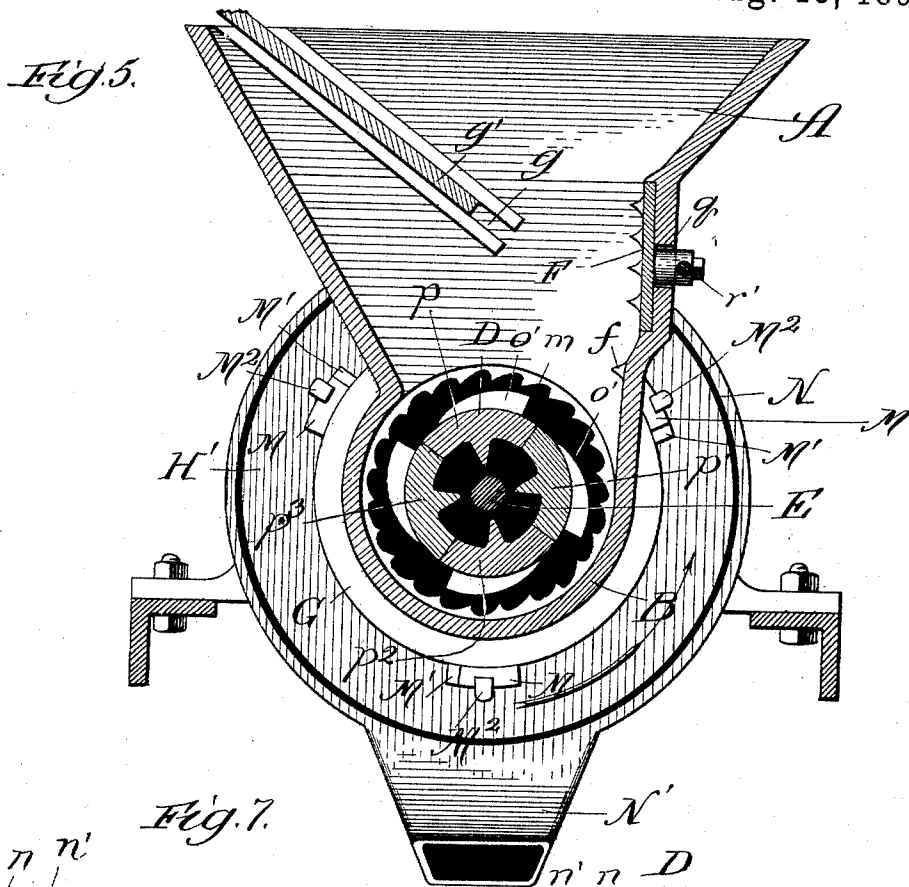
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F. S. RICH.
CORN AND COB CRUSHER AND GRINDER.

No. 503,357.

Patented Aug. 15, 1893.



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Inventor:
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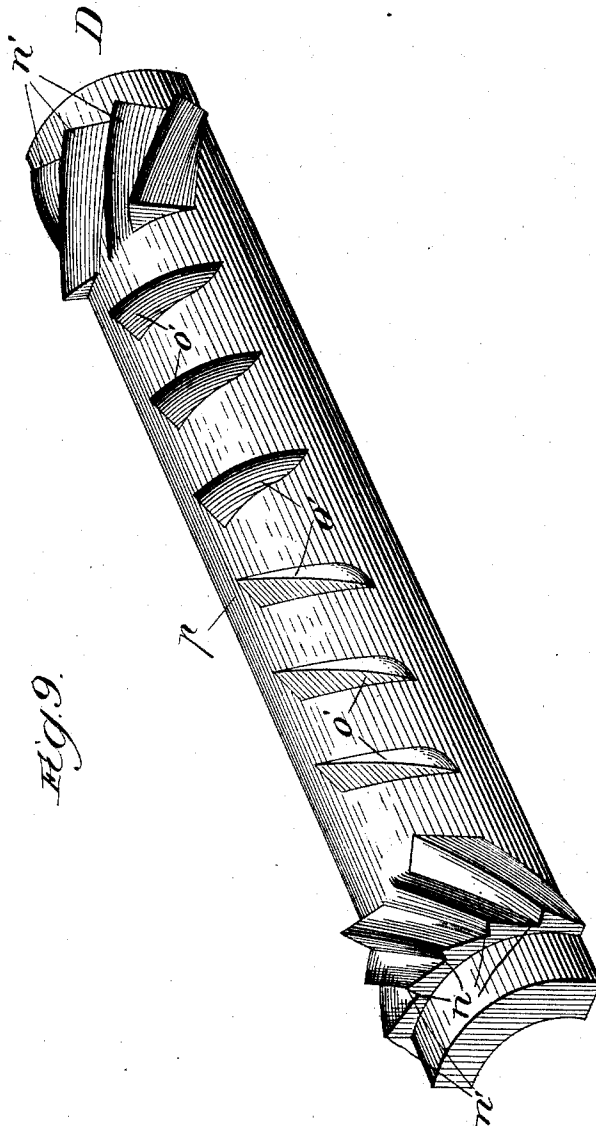
(No Model.)

4 Sheets—Sheet 4.

F. S. RICH.
CORN AND COB CRUSHER AND GRINDER.

No. 503,357.

Patented Aug. 15, 1893.



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UNITED STATES PATENT OFFICE.

FRED S. RICH, OF SYCAMORE, ILLINOIS.

CORN AND COB CRUSHER AND GRINDER.

SPECIFICATION forming part of Letters Patent No. 503,357, dated August 15, 1893.

Application filed March 18, 1892. Serial No. 425,469. (No model.)

To all whom it may concern:

Be it known that I, FRED S. RICH, a citizen of the United States, residing at Sycamore, in the county of De Kalb and State of Illinois, have invented a new and useful Corn and Cob Crusher and Grinder, of which the following is a specification.

My invention relates to an improvement in corn and cob crushers and grinders, and is in the nature of an improvement upon the invention in corn and cob crushers and grinders described in my pending application for Letters Patent of the United States, Serial No. 394,349, filed May 28, 1891.

The object of my present invention is, generally, to simplify the structure while embodying the essential features of the operation set forth in my said pending application. As in the case of my previous device, a construction is employed whereby the ears are fed into a hopper and thence into a cylinder in which a rapidly revolving, horizontally disposed crushing roller is contained, in the course of their passage through the hopper the ears being acted upon by a vibrating plate; but in the present structure I have simplified the means for operating said plate. As before, the crushing roller is provided with teeth of peculiar construction fully described in my said pending application, but I have improved the structure of the roller by making the same in longitudinally divided sections, whereby if any crushing tooth or set of teeth shall be injured, they being cast integral with the roller, said teeth may be removed, and new teeth supplied, by removing the longitudinal section of the roller which carries them. As before, the crushed material is fed through burrs located at each end of the roller, but instead of having these burrs removable I supply their function by a set of obliquely arranged, peculiarly constructed, elongated teeth, which exert a crushing and grinding action in co-operation with the ring having interior serrations. From these crushing teeth the material passes through grinding rings parallel with each other and having on their adjacent faces grinding serrations, one of said rings being adjustable toward and from the other, which is in a stationary position; but in the present device I have improved the method of adjusting the

rings toward and from each other and have also improved the grinding surfaces by giving to the same a coarser serration toward the center changing gradually to a finely serrated character at the circumference. By the foregoing changes I have simplified the construction of the apparatus and materially improved the ease and perfection of its operation, besides permitting the device to be made more compact.

My invention consists in the general and specific details of construction and combination of parts by which the foregoing improvements are brought about, all hereinafter more fully pointed out.

In the drawings: Figure 1 is a view in front elevation of a corn and cob crusher and grinder constructed in accordance with my invention, the drive pulley and fly-wheel, which may be of the form shown in my said pending application, being removed. Fig. 2 is a central longitudinal section through the machine. Fig. 3 is a view in end elevation taken from the right of Fig. 1. Fig. 4 is a perspective view diagrammatic in its form showing one of the grinding rings and illustrating the mode of adjusting the same toward and from the companion ring. Fig. 5 is a transverse sectional view taken on the line 5 of Fig. 2 and viewed in the direction of the arrow. Fig. 6 is a view in elevation of a section of one of the pair of grinding rings; and Figs. 6^A and 6^B opposite edge views thereof. Fig. 7 is a plan view of a section of the crushing roller; and Fig. 8 is a plan view of the adjacent section of the crushing roller showing the disposition of the additional teeth provided thereon. Fig. 9 is a view detached of a section of the roller.

A represents a hopper terminating in the crushing cylinder B and supported in a convenient manner on the frame C. The hopper A and cylinder B are substantially like those shown in my said pending application, and the cylinder contains, as before, a crushing roller D mounted upon a shaft E extending longitudinally through the cylinder.

In the wall of the hopper A is set a plate F caused to reciprocate for the purpose of agitating the ears as they are introduced to prevent their clogging up the hopper. Instead of the mechanism for reciprocating said plate

shown in my pending application, I employ the following mechanism: On the shaft E is provided a worm *t*, the shaft E being caused to revolve under the operation of a pulley, not shown. Supported on the cross shaft on a bracket *s* is a worm-wheel *s'* to the shaft of which is secured a crank *r*, the crank being thus caused to turn with the wheel under the engagement of the worm *t*. From the end of the crank *r* extends a rod *r'*, which may be bent as shown, the opposite end of said rod being connected to the plate F through a slot *q* in the wall of the hopper, as indicated in Fig. 5. By this arrangement the revolution of the shaft E is converted into a reciprocating motion in the rod *r'*, the connections being more simple in their character and surer in their operation than those formerly employed by me.

The cylinder D is provided with inclined ribs inclining in opposite direction from the middle of the cylinder, as fully described in my other application, and the crushing roller is provided with teeth in duplicate sets, those on opposite sides of the middle point of the roller and between it and the respective outlets of the cylinder being arranged to feed respectively in opposite directions, whereby the introduced ears are conveyed toward opposite ends of the crushing roller. Each crushing roller is made in longitudinal sections *p p' p² p³*, preferably four in number, although the number may be greater or less as desired. These sections may be identical with each other, but I prefer on every other section, as *p' p³*, to provide an additional pair of crushing teeth *o*, one at each end, slightly out of line with the crushing teeth *o'* provided on the same section. As in the case of the roller made in a single piece described in my said pending application, the teeth on the present roller, when all the sections are united, will present respective spiral lines, and to bring about the same result in the present case the teeth on the respective sections *p, p', p²* and *p³* are arranged accordingly.

At each end of the roller D are arranged oblique elongated teeth *n n'* to afford a burr section to co-operate with the interior serrations *m* in the ring G to crush to a finer degree the material fed thereto by the crushing teeth *o'*. It will be understood that the oblique teeth *n n'* take the place of the burr rings separably mounted upon the shaft and shown in my said pending application. The teeth *n n'* may be of the same dimension and are preferably characterized by the peculiarity found in the teeth *o'* as fully described in said pending application, viz., having one side vertical to the axis of the roller and the other side warped and rounded to offer slight obstacle to the onward movement of the feed. Instead of making them all of one dimension, however, I prefer to have every other tooth shorter than its neighbor, so that the crushing surface afforded is made up of alternate

long and short teeth, the outer extremity of all being on the same circumferential line and the teeth alternately commencing nearer to the outer extremity to bring about the reduction in length.

Beyond the crushing teeth *n n'* the roller D presents a smooth surface in dimension sufficient to receive the inward projecting flange *l* on the outer grinding plate H. This plate is bolted to the shaft to revolve therewith, and is provided with the annular recessed portion in which is bolted a ring I having on its face a series of serrations *k* varying in their length in regular pattern so that some are of the full length of the width of the ring, others are of less length and others comparatively short. As a result an edge view of the ring in elevation will show a series of notches or serrations (Fig. 6^B) all of the same dimension and continuous around the ring, while a similar view taken from the center of the ring will show occasional angular projections disposed at intervals around the inner surface of the ring, (Fig. 6^A.) The serrations, as clearly shown, in Fig. 6, are oblique, whereby they serve to feed the material outward while grinding.

On a reduced part of the ring G, indicated at *j* Fig. 2, is mounted a ring H' freely movable upon the bearing thus afforded. The ring H' has the annular reduced portion in which is set a ring I' having on its outer face serrations substantially similar to the serrations on the ring I. The ring I' may be of the same dimension as the ring I but I prefer to make it with a larger eye, and hence a reduced radial surface, as shown in Fig. 2. It will be understood that the ring I' is firmly bolted to the ring H' and is longitudinally movable thereon. It will also be observed that whereas the plate H is revoluble with the shaft the ring H' being supported upon the immovable ring is not revoluble. It will also be understood that the ring H' is adjustable on its bearing toward and from its companion ring, and the mechanism for producing this adjustment is as follows: Firmly bolted to the ring H' on the side thereof opposite to the grinding surface is an ear *i* perforated to provide a bolt hole and perforated also to receive a wooden plug *i'*. A lever or handle K is provided at its extremity with a fork *h* to embrace the ear *i* said fork being perforated to receive the bolt *h'* which passes through the bolt-hole in the ear, and also perforated to receive the plug *i'*. Pivotaly supported at the end of a stud on the hopper A is a curved slot arm L, in the slot of which moves a bolt K' secured to the lever K. The bolt is provided with a thumb nut, as shown, to enable it to be tightened at the point to which the lever K may be adjusted on the slot arm. At suitable points upon the ring G are provided inclined or beveled lugs M, preferably three in number, and at corresponding points on the ring H' opposite beveled lugs M' are provided adjacent to which

a hook-shaped lug M^2 is located. When the ring H' is adjusted in position with relation to the ring G the hooks M^2 extend over the lugs M on the ring G , which latter therefore
 5 extend along and in contact with the inclined lugs M' .

From the foregoing description the operation will be readily apparent. The lever K being moved either upward or downward
 10 turns the ring H' with relation to the ring G and moves the inclined lugs M' with relation to their companion lugs M on the ring G , thereby moving the ring H on the ring G to separate or bring together the grinding faces
 15 $I I'$ on the rings $H H'$. The arrangement of joints between the lever K and ring H' is such, due principally to the presence of the readily broken wooden plug i' , that in case of any accident, as the intrusion between the
 20 grinding surfaces of a nail or the like, which would have a tendency to separate the rings, instead of preventing this with consequent injury to the grinding faces the wooden plug shall be broken and the pivots afforded by
 25 the bolts h' and K' coupled with the pivotal support of the slot arm L will permit the ring H' to turn to separate the grinding surfaces. As before, the hood N is provided over the grinding rings, said hood terminating in the
 30 lower outlet N' . It will be understood that a pair of rings $H H'$ with their supports and connected parts is provided at each end of the roller B so that the operation of the machine accomplishes the crushing and grinding in
 35 both directions from a middle point on the roller.

In Fig. 2 is shown a convenient means of supporting the longitudinal sections of the crushing roller on the shaft and comprises a
 40 cylindrical block O located on the shaft to which it is keyed or otherwise secured to rotate, having an external dimension to fit closely within the roller B when the sections are supported together, said block O being
 45 recessed in its enlarged part to receive the heads of the bolts which secure the crushing roller sections thereto.

I find it desirable to provide in the hopper-ends diagonal grooves g (Fig. 5) to receive a
 50 board g' , said grooves and the board carried therein inclined downward toward the falling side of the crushing roller. The purpose of this board is to permit the feed aperture through the hopper to be reduced or increased
 55 as desired. I also provide on the upper edge of the cylinder B an inward projecting series of teeth f , which serve to diminish the width of the upper end of the space in which the crushing takes place under the action of the
 60 crushing teeth o' . This provision serves to prevent the clogging of the apparatus while in operation.

What I claim as new, and desire to secure by Letters Patent, is—

65 1. In a corn and cob crusher and grinder, in combination with the cylindrical outer grinding surface, a roller having at its ends, re-

spectively, oblique, elongated grinding teeth having their base lines in a cylindrical surface co-axial with the surface of the cylindrical roller upon which they are mounted,
 70 and crushing teeth mounted on said roller intermediate of the ends serving to cooperate with the outer grinding surface to crush cobs and feed them onward, and said oblique teeth
 75 serving still further to crush and grind the material, substantially as described.

2. In a corn and cob crusher and grinder in combination with the outer grinding surface, the roller having in one part crushing teeth
 80 arranged at intervals on spiral lines around the roller and at its extremities a series of oblique elongated teeth alternately longer and shorter and all terminating at the edge of the roller, substantially as described.
 85

3. In a corn and cob crusher and grinder the combination with the outer grinding surface of an inner grinding device comprising
 90 a series of alternately longer and shorter oblique elongated teeth having a side vertical to the plane of the axis of rotation and the other side warped and rounded in the direction of the feed, substantially as described.
 95

4. In a corn and cob crusher and grinder the combination with the outer grinding surface of an inner grinding device composed of
 100 sections adjusted and held together to produce a ring, each section having thereon alternately longer and shorter oblique elongated teeth having a straight side vertical to the axis and a warped and rounded side in the direction of the feed, the parts being adjusted together substantially in the manner and for the purpose set forth.
 105

5. In a grinding machine the combination with the revolving shaft and the plate secured to revolve therewith and carrying on its face
 110 a serrated grinding ring and with a stationary body provided at intervals with oblique lugs of a ring carrying serrations mounted on said stationary body to be capable of moving thereon and held from revolution during the
 115 revolution of the shaft, hooks on said ring and inclined lugs on said ring adjacent to the hook, said hooks adapted to embrace the inclined lugs on the stationary body thereby bringing the inclined sides of the lugs respectively in contact with each other, and a lever secured to said ring for turning the same, substantially as described.
 120

6. In a grinding machine the combination with the revolving shaft and a plate mounted to revolve thereon and carrying grinding serrations on its inner face and with a stationary body such as the ring G of a ring H' carrying
 125 on its inner face a serrated grinding ring to cooperate with the grinding surface on the revolving plate, hook lugs at intervals on the outer surface of said ring and inclined lugs adjacent to said hook lugs, inclined lugs on the stationary body engaged by said hook-
 130 lugs, a lever secured to said ring H' , a slot arm secured to a stationary part of the machine and an adjustable connection between

said lever and slot arm in the slot thereof, substantially as and for the purposes set forth.

7. In a grinding machine employing a grinding surface revoluble with the shaft and a separably mounted cooperating grinding surface adjustable toward and from its companion grinding surface through the medium of a hand lever, the connection between said lever and adjustable grinding device comprising a pivot bolt *h'* and a readily broken plug *i'* passing through the members to prevent their turning on the pivot afforded by said bolt, substantially as described.

8. In a corn and cob crusher and grinder the combination with the hopper and crushing cylinder of a revolving shaft E, blocks O on said shaft, each having an inner recess to produce an annular space around the shaft to receive the bolt heads sectional crushing roller D carrying crushing teeth and having the interior strengthening ribs and bolted to said blocks, substantially as described.

FRED S. RICH.

In presence of—

M. J. FROST,

J. N. HANSON.