

(No Model.)

4 Sheets—Sheet 1.

F. S. RICH.

CORN AND COB CRUSHER AND GRINDER.

No. 471,828.

Patented Mar. 29, 1892.

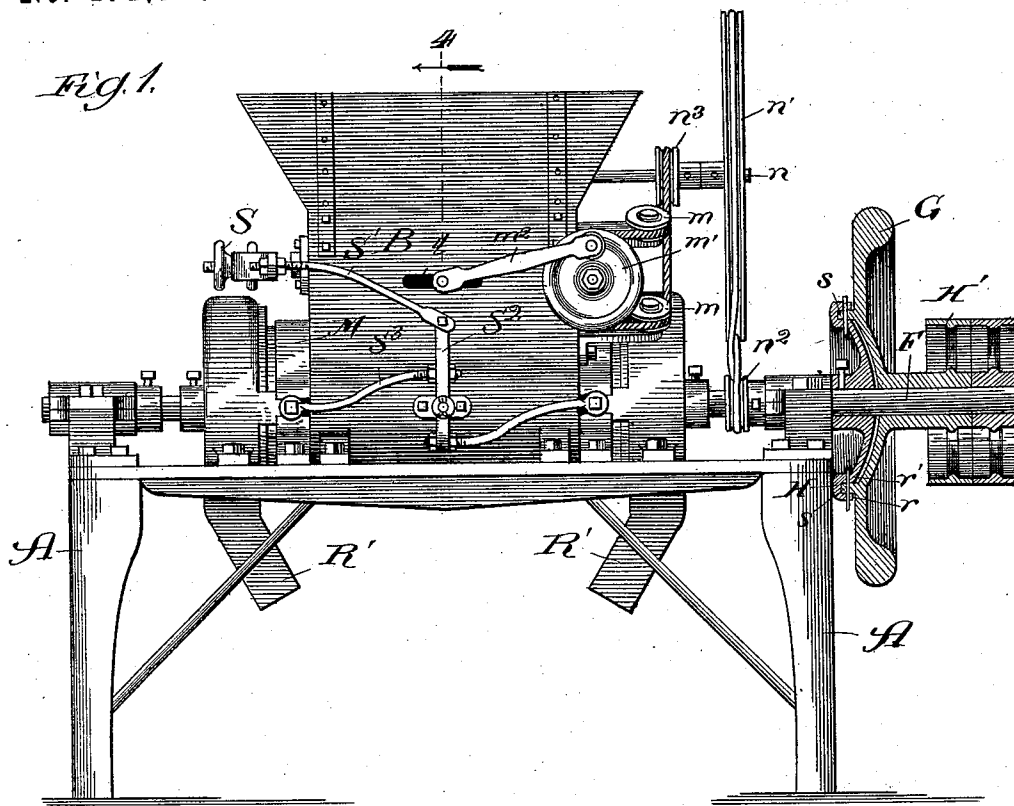
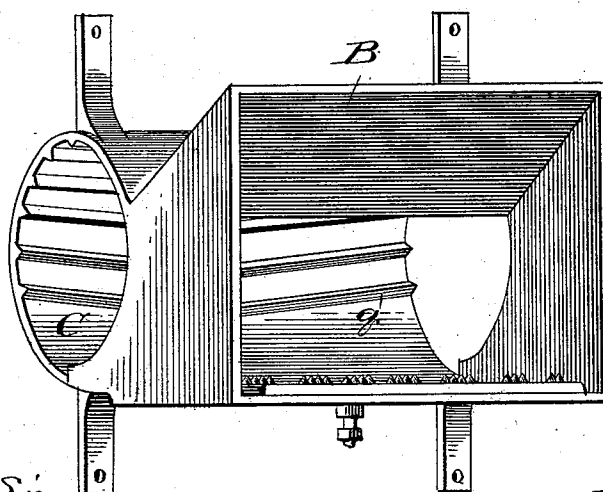


Fig. 2.



Witnesses:
Edw. Claydon
Clifford White

Inventor:
Fred S. Rich
By R. W. Smith & R. W. Smith
Attys

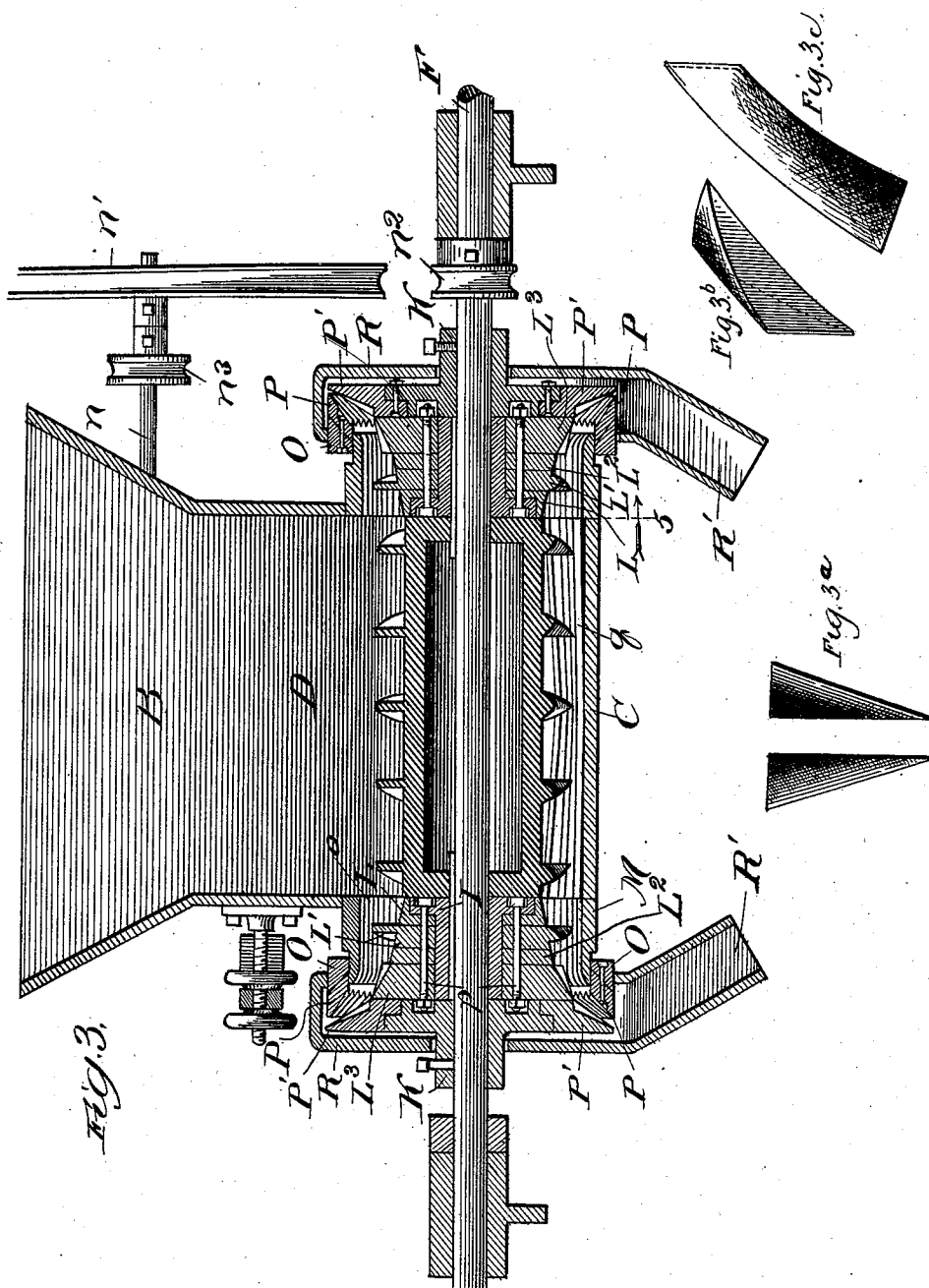
(No Model.)

4 Sheets—Sheet 2.

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

No. 471,828.

Patented Mar. 29, 1892.



Witnesses:
Edw. C. Mayhew
Clifford W. White

Inventor:
Fred S. Rich
By R. B. Smith & R. B. Smith
Attorneys

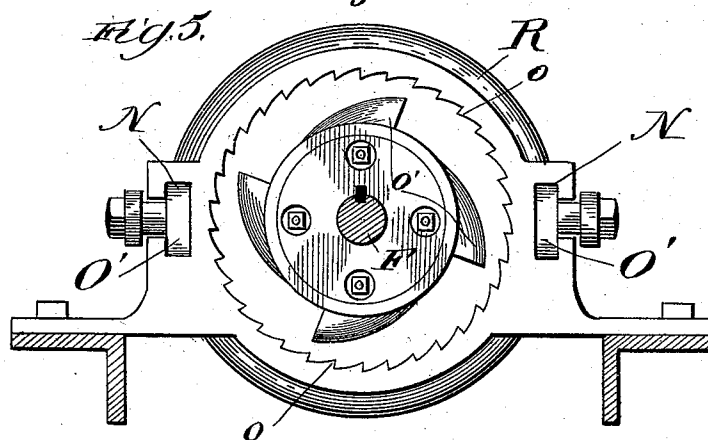
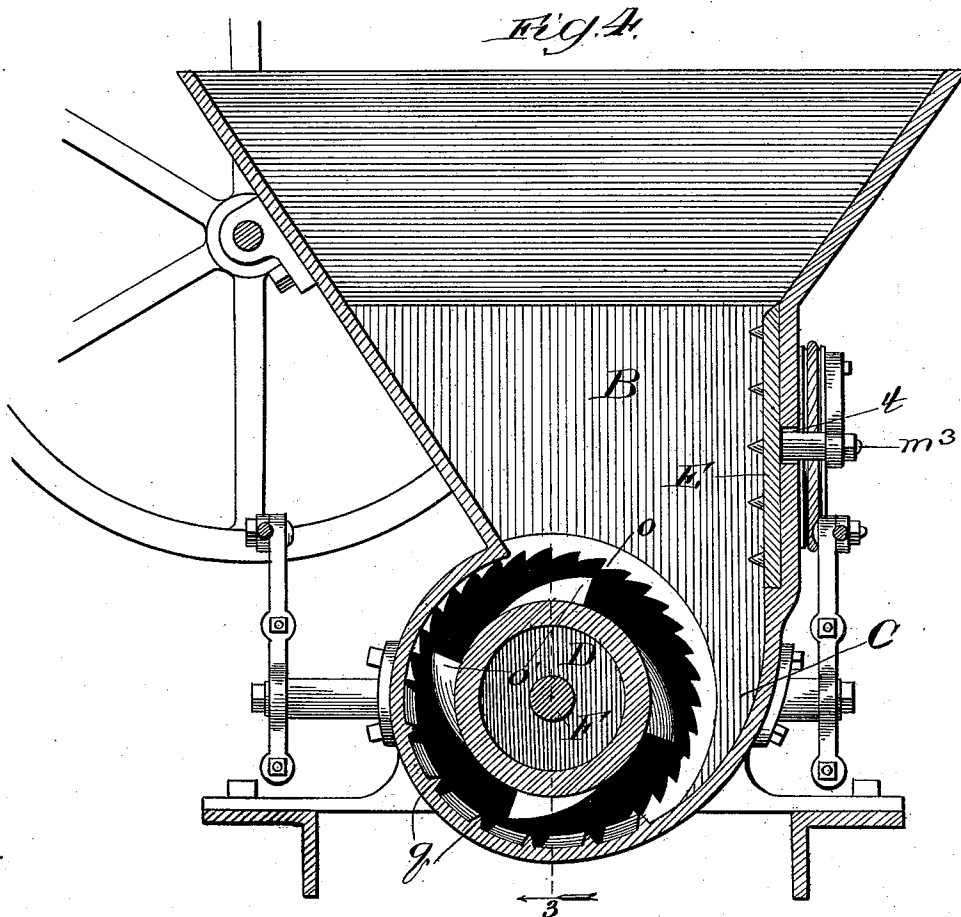
(No Model.)

4 Sheets—Sheet 3.

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

No. 471,828.

Patented Mar. 29, 1892.



Witnesses:
Frank S. Clifford.
Clifford H. White.

Inventor:
Fred S. Rich,
By *Deputy* *Deputy*
Attorney

(No Model.)

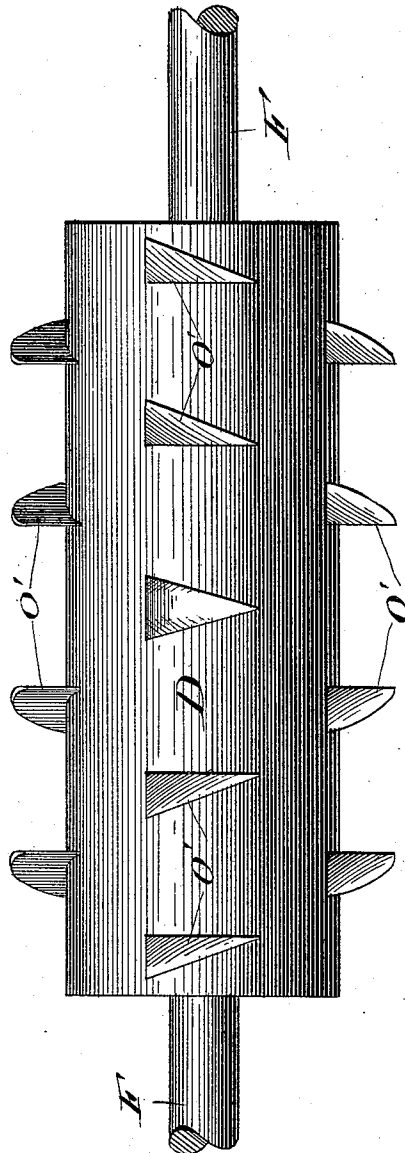
4 Sheets—Sheet 4.

F. S. RICH.

CORN AND COB CRUSHER AND GRINDER.

No. 471,828.

Patented Mar. 29, 1892.



Witnesses,
 Carl & Carolyn
 Clifford White.

Inventor:
Fred S. Rich,
By *Alfred S. Rich*
Attys.

UNITED STATES PATENT OFFICE.

FRED S. RICH, OF SYCAMORE, ILLINOIS.

CORN AND COB CRUSHER AND GRINDER.

SPECIFICATION forming part of Letters Patent No. 471,828, dated March 29, 1892.

Application filed May 28, 1891. Serial No. 394,349. (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 its object is, primarily, to furnish a construction by which with the least expenditure of power a great amount of work may be performed by the crushing rollers and burrs.

The further object of my invention is to provide a construction which will permit various parts of the apparatus to be removed without necessitating the dismantling of the entire machine, particular reference being had to the removal of the burr-wheels when they shall become worn or be broken in use.

To these ends my invention consists, primarily, in a corn and cob crusher and grinder comprising a ribbed chamber or cylinder and a crushing-roller provided with teeth revolving within the chamber, and separable burr-wheels varying in the coarseness of the grind, said burrs and crushing-roller being mounted upon a single shaft to which the power is applied.

My invention consists, further, in a corn and cob crusher and grinder comprising a hopper and crushing-roller having teeth thereon arranged to feed from the center toward both ends, and duplicate sets of burr-wheels having differently-pitched grinding-teeth and arranged in series upon a single shaft to which the power is applied.

My invention further consists in the general and specific arrangement of parts, all as hereinafter more fully pointed out and claimed.

In the drawings, Figure 1 is a front elevation of a corn and cob crusher and grinder involving my improved construction. Fig. 2 is a perspective view of the hopper. Fig. 3 is a vertical central section on the line 3, Fig. 4, showing the internal construction. Fig. 3^a is a plan view of the teeth, respectively, left and right, on the crushing-cylinder. Fig. 3^b is a perspective view taken from one side of one of these teeth, and Fig. 3^c a perspective view taken from the opposite or spiral side of one of these teeth. Fig. 4 is a vertical cross-

section on the line 4, Fig. 1, and Fig. 5 is a cross-section on the line 5, Fig. 3. Fig. 6 is a longitudinal side elevation of the crushing-roller.

A represents the frame of the machine, upon which all the operative parts are mounted.

B represents the hopper, terminating in its lower part in a cylinder C. I prefer the construction of hopper and cylinder illustrated in Fig. 4 in cross-section, in which one of the inclined sides of the hopper is directed downward to a point nearly above the center of the cylinder, whereby the ears as fed into the hopper will be given a tendency to fall toward the front of the cylinder C and in the line of the forward movement of the crushing-roller D. The object of this construction is to prevent the ears from falling on both sides of the crusher and thus interfering with the freedom of feed. The front face of the hopper B is recessed, and through the wall is formed a longitudinal opening *t*. In this recess is supported a toothed plate E, caused to reciprocate by mechanism presently described, the purpose of which is to produce a displacement in the ears and prevent their clogging the hopper.

Passing centrally through the cylinder C and extending out through journals provided in the frame is the shaft F. At its outer end the shaft F carries the peculiar construction of fly-wheel and drive-pulley illustrated in detail in Fig. 1, and described as follows: The fly-wheel G forms part of the same casting with the belt-pulley H', and is provided on its inner face with an annular projection or flange *s*, through which bolt-apertures are cut, as indicated in the drawings. The drive-pulley H' and fly-wheel are loosely mounted upon the shaft F. An annular curved disk H is keyed to the shaft F and provided with the double flange *r r'*, forming a collar, which embraces the annular flange *s* on the fly-wheel G. Through the flanges *r r'* bolt-holes are also cut, as indicated in the drawings, to coincide with the bolt-holes on the flange *s*. Through the coincident bolt-holes wooden pegs are passed, which, while serving to hold the fly-wheel and curved disk together during the usual operation of the machine and while no unusual strain is exerted, (as by the introduction of foreign material in the burrs

or the like,) yet in case of a sudden stoppage in the crusher, which would otherwise have a tendency to disarrange the driving apparatus, the resistance at the joint between the curved disk and fly-wheel will break the wooden pins and permit the drive-pulley and fly-wheel to revolve freely without driving the shaft.

Mounted upon the shaft F within the cylinder C is the toothed crushing-roller D, the teeth o' of which, except those at the middle, as indicated in Figs. 3 and 6, are wedge form and are arranged in planes divergent from the median transverse plane of the cylinder and converging thereto in the direction of rotation. Said teeth present forward cutting-edges and have straight outer sides perpendicular to the axis to force the material toward the end of the cylinder and present inner faces, which warp and round over the back of the teeth to present as little resistance as possible to the onward movement of the material. The central teeth are curved back and downward in the direction of both ends of the cylinder, being thus substantially each a double right and left tooth. By this construction upon the feeding of the ears to the cylinder they are distributed right and left toward the burr-wheels arranged in duplicate on opposite ends of the cylinder and mounted upon the shaft F. The crushing effect of the teeth upon the roller D is accomplished with the assistance of the ribs g , located upon the bottom of the cylinder C, these ribs being inclined, as shown, to assist the operation of the teeth upon the cylinder in feeding the ears to the opposite ends.

The burr-wheels are in duplicate, as before stated, and are all mounted on the same shaft F. It will be necessary, therefore, to describe only the construction at one end, which is as follows, reference being had particularly to Fig. 3: A cylindrical bearing I is introduced over and keyed to the shaft F, the inner enlarged end or flange of this bearing being brought into close contact with the end of the crushing-roller D and is recessed for the reception of bolt-heads. The bearing is provided with external splines and is held firmly in place by a collar K, introduced over the shaft and held by a set-screw. The bearing I receives the burr-wheels $L L' L^2 L^3$, each of which has an interior spline to engage the spline formed upon the bearing, and each therefore revolves with the revolution of the bearing and shaft. For greater security longitudinal bolts p are passed through the various burr-wheels and through the flange of the bearing I, as indicated in Fig. 3. A ring M, internally flaring at its outer end, is bolted to the frame and has on its inner periphery crushing-serrations o , which act with the peripheral crushing-teeth o' , formed upon the several burr-wheels $L L' L^2 L^3$, which teeth are similar in form to those on the roller D, to crush the ear in its passage outward through the apparatus. It should be understood that the teeth upon the respect-

ive burr-wheels L, L', L^2 , and L^3 are arranged to afford a different degree of coarseness in crushing, becoming finer as the material advances. It should further be stated that when adjusted together the burr-wheels afford a beveled wheel having its greater diameter at the outside. In introducing the first burr-wheel L upon the bearing I, I prefer to provide the wheel with a recess in its face to permit it to extend over and embrace the flange of the bearing I, as before described. The last burr-wheel L^3 is made with a decided bevel, as shown, to effect the feed with greater certainty into the grinding-burrs $P P'$, presently described. The teeth on each burr-wheel $L L' L^2 L^3$ are four in number, inclined and located as shown, and the burr-wheels are so adjusted together that the teeth will form a spiral line extending across all the burr-wheels from L to L^3 . The ring M is provided laterally with ears, producing the passages N, the ears being elongated, if desired, to afford a convenient means of bolting the ring to the frame. A collar O, provided with the forward projecting guides O' , is introduced over the outer edge of the ring M in such a manner that the arms O' shall enter the passages or recesses N, wherein they may be bolted or otherwise secured to adjusting-arms, presently described.

The last pair of grinding-rings (indicated by the letters $P P'$) are introduced upon the shaft F in the following manner: A bearing K, having a shoulder formed upon its inner face, receives the recessed grinding-ring P' , while the companion grinding-ring P is bolted to the collar O and is stationary. The ring P' revolves with the bearing K, which is keyed to the shaft. Over the last-named grinding-rings a hood R is supported, terminating in its lower end in a discharge-chute R' . The power is applied from any convenient source to the band or drive wheel H' . At a suitable point above the shaft F, I support the supplemental shaft n , carrying the band-wheel n' , from which a belt extends to a pulley n^2 on the shaft F, and upon this shaft n I also provide a band-wheel n^3 , from which leads a driving-belt over guide-pulleys m to the crank-wheel m' . From this wheel a pitman m^2 extends to the sliding toothed plate E, connecting with the latter through the medium of the tie-bolt m^3 . By this mechanism, as will readily appear, the revolution of the shaft, causing the revolution of the crusher-rolls and burr-wheels, also produces a reciprocation in the plate E, which brings about the displacement of the contained ears and prevents their choking the hopper.

A special feature of my apparatus is the adjustable character given to the final grinding-rings $P P'$. This I accomplish through the medium of the adjusting-screw S, from which to opposite sides of the apparatus lead adjusting-arms S' , and to these arms S' are connected pivoted arms S^2 , from opposite sides of the pivot of which extend links S^3 ,

the opposite ends of which are joined to the projecting guides O' through the medium of nut-and-bolt connections. As will appear, the turning of the set-screw S by operating the links S³ will bring the stationary ring P nearer to or farther from the revolving ring P', thus permitting the fineness of grinding finally given to the corn and cob to be regulated at will.

10 In case any of the parts of the crushing or grinding mechanism shall become disarranged or broken it may be readily removed from the apparatus by simply taking off the bearings and other removable parts at the same end of the machine.

15 By avoiding the employment of gear connections in the apparatus I am enabled to perform a larger amount of work with the employment of less power, and this is an important feature of my invention.

20 The operation, generally stated, is as follows: The rings P P' being adjusted and the parts otherwise put together in the manner above described, the ears are introduced into the hopper B, power being applied to the drive-pulley H'. The plate E immediately reciprocates, and the crushing-roller B revolves, crushes the ears, and feeds them to the burr-wheels L, L', L², and L³, where the crushing is continued with the onward feed, and whence the corn and cobs pass between the grinding-rings P P' and thence through the chute R'.

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

1. In a corn and cob crusher and grinder, in combination with the cylindrical outer grinding-surface, a crushing-roller carrying thereon crushing-teeth, said teeth being wedge form and arranged in planes divergent from the median transverse plane of the cylinder and converging thereto in the direction of the rotation, having a forward cutting-edge and one side perpendicular to the axis, and inner faces which warp and round over the back of the teeth, substantially as and for the purpose set forth.

2. In a corn and cob crusher and grinder, in combination with the cylindrical outer grinding-surface and with the hopper leading thereto, a crushing-roller provided with oppositely-operating teeth on opposite sides of the center of the cylinder, said teeth being wedge form and arranged in planes divergent from the median transverse plane of the cylinder and converging thereto in the direction of rotation, said teeth presenting forward cutting-edges and having straight outer sides perpen-

dicular to the axis to force the material toward the adjacent end of the cylinder and away from the center and having inner faces which warp and round over the back of each tooth to present as little resistance as possible to the onward movement of the material, said roller being provided with a central annular line of teeth, each presenting a cutting-edge and a warping and rounding back converging toward the cylinder, the warping and rounding being toward both ends of the cylinder, whereby the material fed through the hopper shall be crushed and conveyed toward the opposite ends of the cylinder, respectively, substantially as described.

3. In a corn and cob crusher and grinder, in combination with the crushing cylinder and roller and burr-wheels, the revolving grinding-ring P' upon the shaft of the crushing-roller and at the side thereof, and the stationary and adjustable companion grinding-ring P, coacting with the revolving ring P', and bolts p, passing through apertures formed in the body of all the burr-wheels, one of said wheels being provided with a recess to receive the bolt-head, substantially as described.

4. In a corn and cob crusher and grinder, in combination with the hopper, the reciprocating toothed plate E, set into the wall of the hopper, as and for the purpose described.

5. A corn and cob crusher and grinder comprising, in combination, a hopper, a cylinder at the lower end of the hopper, a crushing-roller mounted upon a shaft to revolve within the cylinder, said crushing-roller provided with crushing-teeth having an opposite inclination on the opposite sides of the middle of the roller, and duplicate sets of burr-wheels and co-operating rings at each end of the cylinder, said wheels mounted upon said shaft, said burr-wheels being separable from each other in each set, but held together, the whole being arranged to operate substantially as and for the purpose described.

6. In a corn and cob crusher and grinder, in combination, the driving-shaft F, the drive-wheel and fly-wheel permanently secured together and loosely mounted on the driving-shaft, said fly-wheel having the annular flange s near its center, disk H, keyed to the shaft and carrying the annular collar r r', embracing the flange s, and a frangible connection between the flange and collar, substantially as and for the purpose described.

FRED S. RICH.

In presence of—

J. W. DYRENFORTH,
M. J. FROST.