J. E. HOVENDICK.

ROLLER CRUSHING AND GRINDING MILL.

APPLICATION FILED DEC. 19, 1910.

1,000,913. Patented Aug. 15, 1911

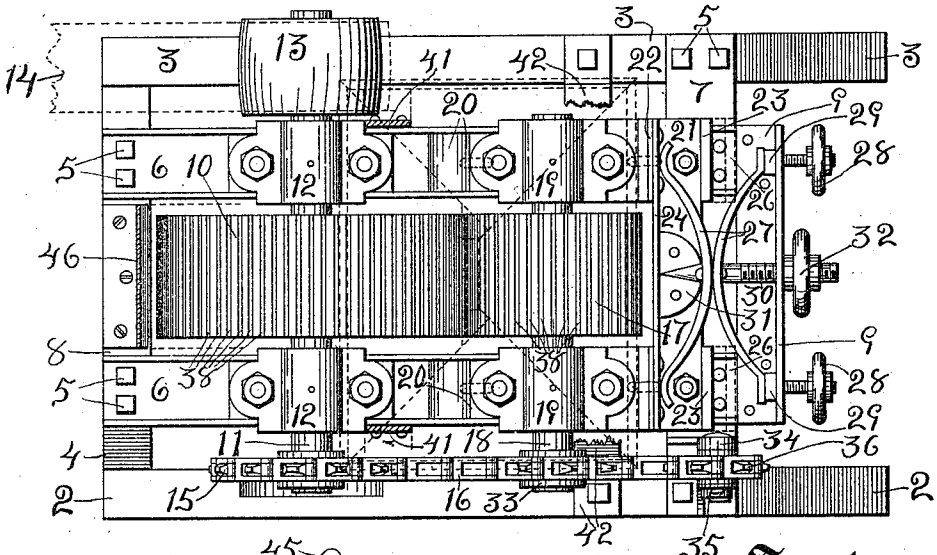

Fig. 1.

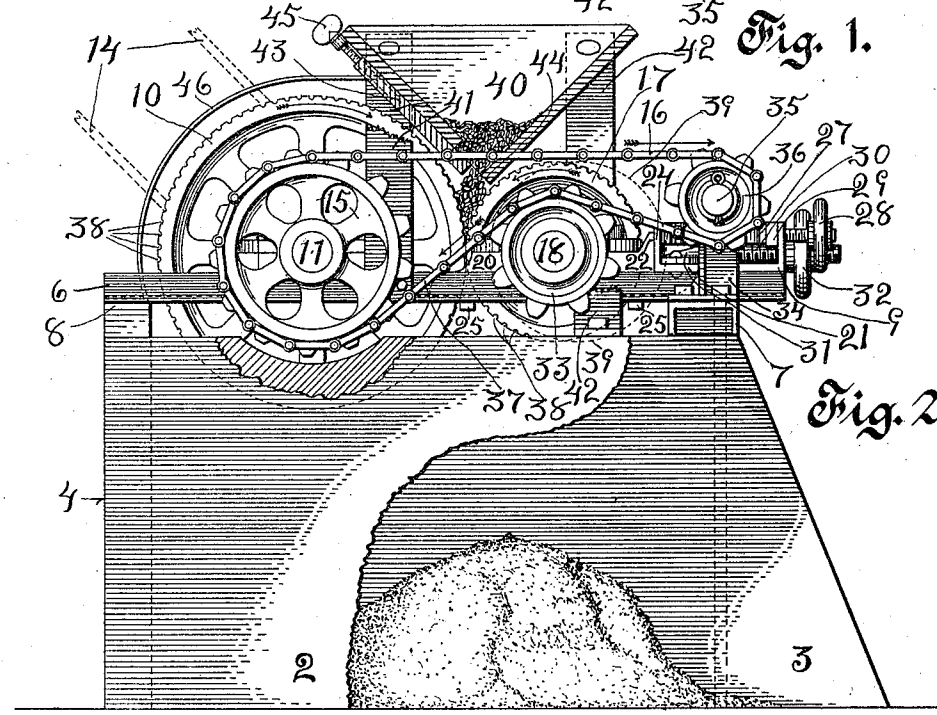

Fig. 2.

WITNESSES:

F. A. Folden

Burl Vaughan.

INVENTOR:

John E. Hovendick,

BY Lou. Vaughan,

his ATTORNEY.

UNITED STATES PATENT OFFICE.

JOHN E. HOVENDICK, OF BLAIR, NEBRASKA.

ROLLER CRUSHING AND GRINDING MILL.

1,000,913. Specification of Letters Patent. Patented Aug. 15, 1911.

Application filed December 19, 1910. Serial No. 598,022.

To all whom it may concern:

Be it known that I, JOHN E. HOVENDICK, citizen of the United States of America, residing at Blair, in the county of Washington and State of Nebraska, have invented certain new and useful Improvements in Roller Crushing and Grinding Mills, of which the following is a specification.

My invention relates to improvements in roller crushing and grinding mills, in which a pair of plain cylindrical rolls operate in conjunction with means to adjust them toward and from each other to regulate the fineness of the ground product and in which the peripheral grinding surfaces of the opposed rolls are driven at different speeds; and the objects of my improvement are, first, to provide in connection with a heavy stationarily disposed revolving roll, serving also as a fly-wheel, a much lighter roll revolubly mounted on a light carriage whereby it may be easily reciprocated laterally to its axis toward and from said large unyieldingly placed roll or fly-wheel; second to provide an ample catch-bin and shovel-bin beneath the rolls and at the same time not unduly elevate the feed hopper; third, to provide a positive intake or bite of the rolls in connection with the hopper feed that will prevent clogging with kernels of any size or hardness and an unyielding abutment to prevent a revolving clog when crushing vegetables, fruits or mast; fourth, to automatically accelerate the speed of the slow moving roll to approximately equal that of the more rapidly moving roll when an irreducible obstruction is accidentally passed between the rolls, by which equalization of motion the grinding action between the rolls is arrested and the obstruction more quickly thrown out, thus preserving the grinding surfaces uninjured; and, fifth, to provide means to yieldingly support one roll toward the other with an adjustable detent to positively limit the approach of the yielding roll toward the other. These, with other minor objects, hereinafter noted, I attain by the mechanism illustrated in the accompanying drawing in which—

Figure 1 is a top or plan view with the hopper and large roll shield cut away to reveal all the lower parts; and Fig. 2, is a side elevation partly in section. In all of which views the same reference numerals refer to like parts.

The heavy plank sides 2 and 3 and rear closing end 4, form a U-shaped catch-bin and shovel-bin beneath the mill and supply an elevated support therefor, on top of which the metal frame of the mill is fastened by the lag-screws 5.

The metal frame of the mill consists of the two side channel-bars 6 and 6, spaced apart and disposed parallelly to receive the grinding rolls axially crosswise between, as shown, with their plates or webs downward and the side flanges standing upwardly. The forward ends of these sides are disposed across to project beyond and are bolted to the inverted cross-channel bar 7; which cross-bar is of sufficient length to span the bin beneath; while the rear ends of the side-bars are fastened directly on the elevated top 8 of the end of the bin. Across the tops of the forward ends of the side-bars the angle-bar 9 is fastened with its upstanding vertical flange flush with the ends of the side-bars. The whole frame thus being U-shaped and reversely disposed to the U-shaped bin on which it rests.

The large roll 10 is mounted on the driving-shaft 11 journaled across in the boxes 12 and 12 seated and fastened in the side channels to dispose said roll at the rear end of the space between the sides. The driving belt pulley 13, is mounted on one end of this driving shaft to receive a driving-belt 14; and a sprocket-wheel 15 is mounted on the opposite end of said shaft to carry and drive the sprocket chain 16 by which the small roll is driven.

The small roll 17 is mounted on the countershaft 18 journaled across in the boxes 19 and 19. These boxes, below their caps, are integral top portions of the side-pieces or legs 20 and 20 of a forwardly and backwardly slidable U-shaped carriage. To complete said carriage, a connection is made at the forward ends of the sides by a cross angle-bar having the ends of its lower horizontal flange 21 seated and rigidly fastened in recesses formed between the shoulders 22 and 22 on the side-pieces and the upstanding lips 23 and 23 at the extreme forward ends of said side-pieces; the upstanding vertical flange 24 of said cross-angle-bar is disposed and fastened against said shoulders; thus forming a rigid connection between the sides of the U-shaped carriage, which corresponds in shape and position with the supporting frame, but is shorter. The sides of the carriage are fitted to slide

between the flanges and on the plate or web of the side channels of the frame, and are retained therein by the machine screws 25 disposed through longitudinal slots in said channel plates, which slots are indicated by broken lines in Fig. 1. A space is arranged between the lips 23 at the head of the carriage and the back edge of the cross-angle-bar 9 at the head of the frame, allowing the carriage to slide forward, to the position indicated by the broken lines 26 in Fig. 1, to carry the small roll away from the larger roll.

An X spring 27 is disposed between the vertical flange of the angle-bar 9 on the head of the frame and the vertical flange 24 of the angle-bar on the head of the carriage, to yieldingly press the carriage backwardly and hold the small roll toward the larger roll. The wheel screws 28 and 28 are disposed through the vertical flange of the angle bar 9 and the nuts 29 thereagainst, to engage the ends of the forward leaf of the spring to increase the tension thereof when screwed inwardly, to increase the pressure of said small roll toward the larger one. And the short adjusting-rod 30 has its rear end flattened as shown at 31 and riveted centrally to the horizontal flange 21 on the carriage head; the opposite threaded end is disposed forwardly and loosely through a central aperture in the vertical flange 9 on the frame. The wheel-nut 32 is mounted on this threaded end forward of the flange against which the nut bears to limit the backward movement of the carriage and small roll, to regulate the fineness of the grinding. This arrangement allows the carriage to slide forward against the action of the spring.

A sprocket-wheel 33 is mounted on one end of the countershaft 18 carrying the small roll, and in alinement with the driving sprocket wheel 15. Farther forward the upright 34 is footed and bolted to the end of the inverted cross channel-bar 7. The stub axle 35 is disposed in the top of said upright and upon this stub axle the idler sprocket-wheel 36 is mounted in alinement with the sprocket-wheels on the roller shafts. The forward loop of the sprocket chain is carried by this idler; and the lower or return run 37 of the sprocket chain passes backwardly over the sprocket wheel 33, to drive the small roll in a direction opposite to the direction of revolution of the larger roll, all as indicated by the arrows in Fig. 2. This chain and sprocket gearing, connecting the two rolls, is so calculated and constructed for speed, that the peripheral velocity of the larger roll is normally a little faster than that of the small roll; that is the grinding and crushing surfaces of the larger roll ordinarily has the greater speed; this difference of speed adding grinding action to that of crushing between the rolls. And attrition is further facilitated by the small semi-circular grooves 38 cut across the grinding faces parallel with the axes of the rolls. But, when by accident some irreducible object, which the rolls are incapable of disintegrating, is passed between them, the yielding spring-pressed small roll, with carriage and connected sprocket-wheel, will move forwardly away, toward or to the position indicated by the broken circular line 39 in Fig. 2. This forward movement of the sprocket wheel against the backward motion of that part of the sprocket chain that is driving it, accelerates the speed of the small roll to fully equal that of the larger. This stops for the instant the grinding action between the rolls and more quickly discharges the obstruction, without injury to the grinding surfaces.

A splayed-sided hopper 40 is supported on the rear uprights 41 having their lower ends riveted to the outer flanges of the side channels of the frame, and on the front uprights 42 footed and lag-screwed on the tops of the bin-sides as shown. By the use of a small roll in front I not only lighten the spring-pressed yielding and adjustable part of the mill, making it easier to manipulate and control, but am enabled to set the hopper much lower with its feed-gate 43 opening close in and toward the mouth of the mill. And by this means the heavy stationarily-journaled roll has ample space back of the hopper in which its size is increased so that it also serves well as a fly-wheel to make the mill run smoothly; and by the large curvature of its grinding surface the intake or mouth of the mill is sharpened, making the bite more gradual so that large kernels of hard grain, like corn, will not rebound or clog in the mouth to let the rolls slide around thereon instead of drawing them in. The inner lower end of the hopper front 44 serves as a bumper or unyielding abutment to prevent a revolving clog or rebound, caused by difference in speed of the opposed crushing and grinding faces, when crushing small vegetables, fruits or mast. The thumb-screw 45 is connected to regulate the opening of the feed gate.

A bent sheet-metal shield 46 to guard the exposed part of the large roll or fly-wheel, is fastened at its lower end by screwing it to the back end of the catch-bin and its top is supported from the back of the hopper as shown.

I claim:

1. The combination of a stationarily journaled roller, an opposed laterally reciprocating roller, means connected to carry said reciprocating roller and yieldingly press it toward said stationarily journaled roller, a driving sprocket wheel rigidly connected to said stationarily journaled roller, an endless

sprocket chain carried by said driving sprocket wheel, a stationarily journaled idler to carry the opposite loop of said chain, a sprocket wheel rigidly connected to said reciprocating roller and disposed outside of the loop of said chain and in engagement with the run of the chain toward said driving sprocket wheel.

2. The combination of a stationarily-journaled driving sprocket wheel, a sprocket chain carried by said driving sprocket wheel, a stationarily-journaled idler to carry the opposite loop of said chain, a driven sprocket wheel disposed outside of the loop of said chain and in engagement with the return run thereof toward said driving sprocket wheel, and means connected to reciprocatingly carry said driven sprocket wheel along said return run of said chain.

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

JOHN E. HOVENDICK.

Witnesses:
HERMAN H. STRUVE,
GEO. B. WELLSEY.