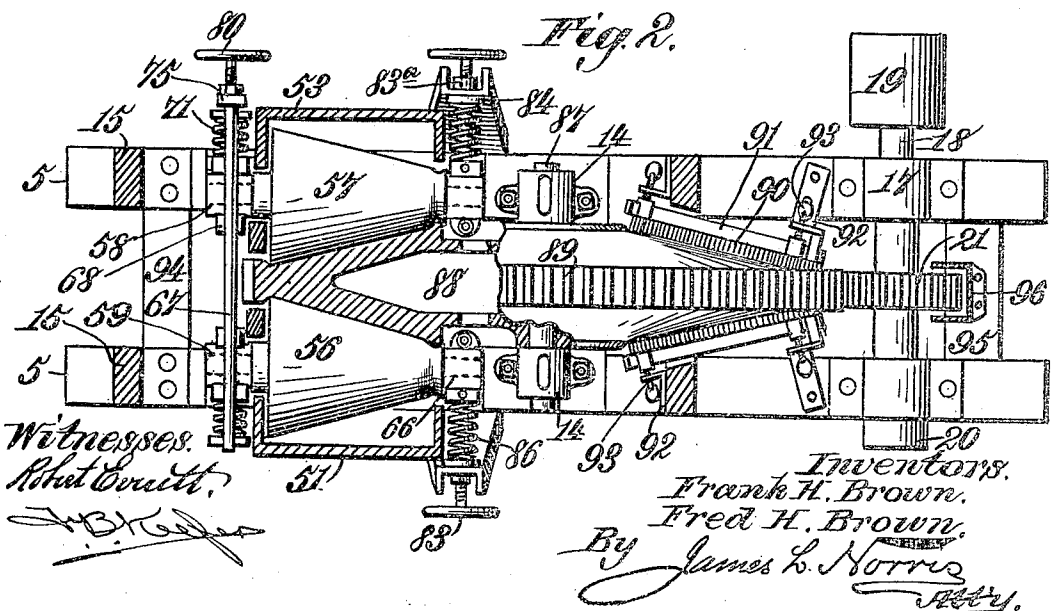
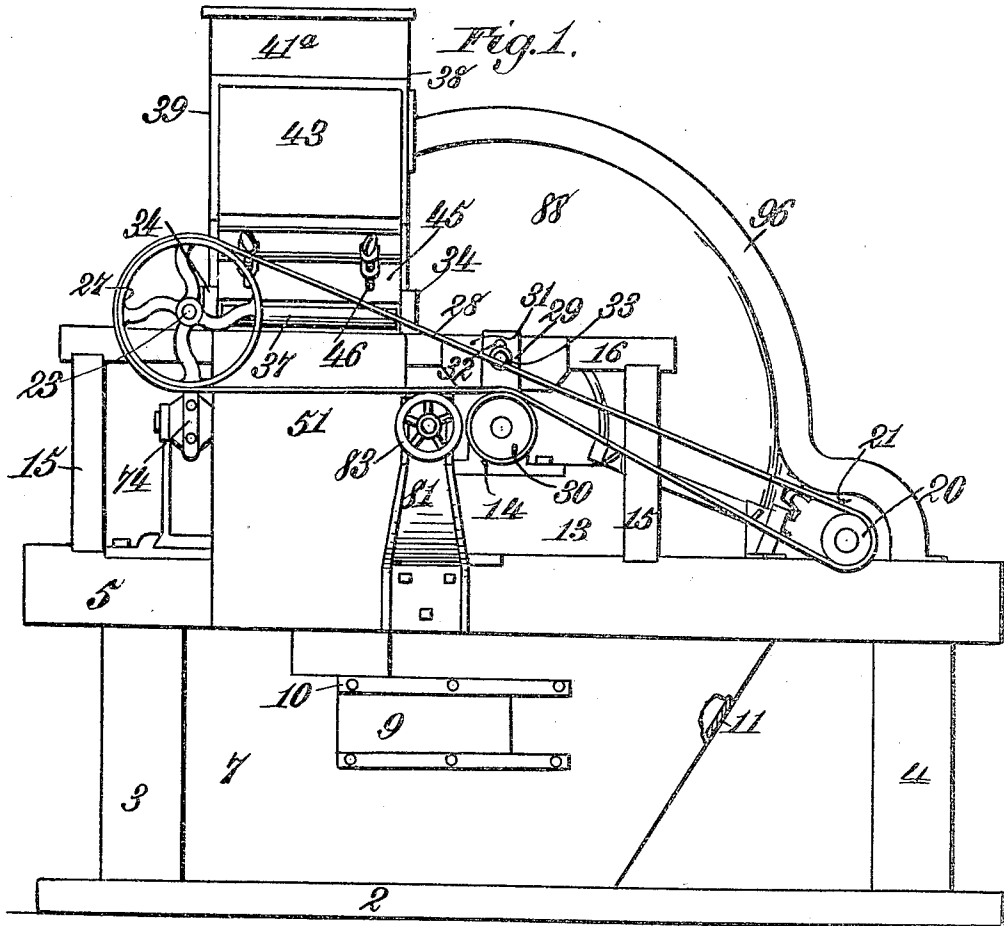


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APPLICATION FILED AUG. 19, 1908.

958,085.

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3 SHEETS—SHEET 1.



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Fig. 3.

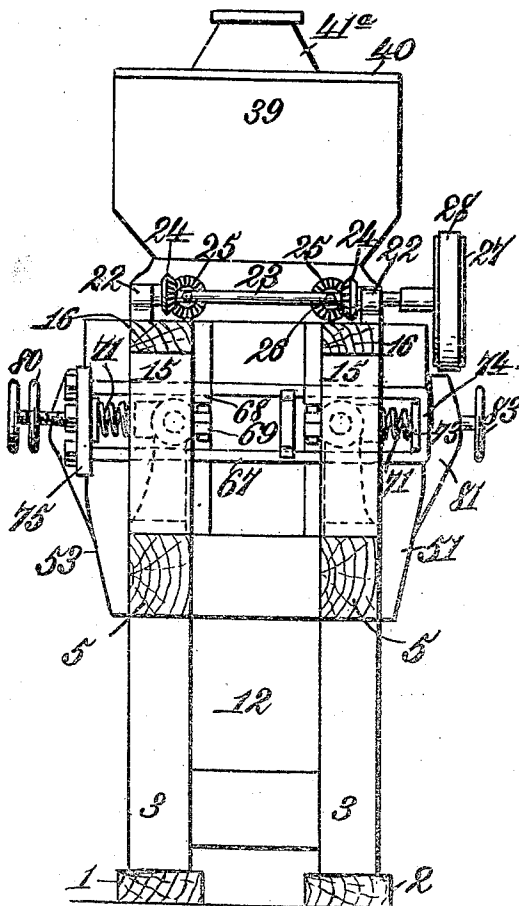
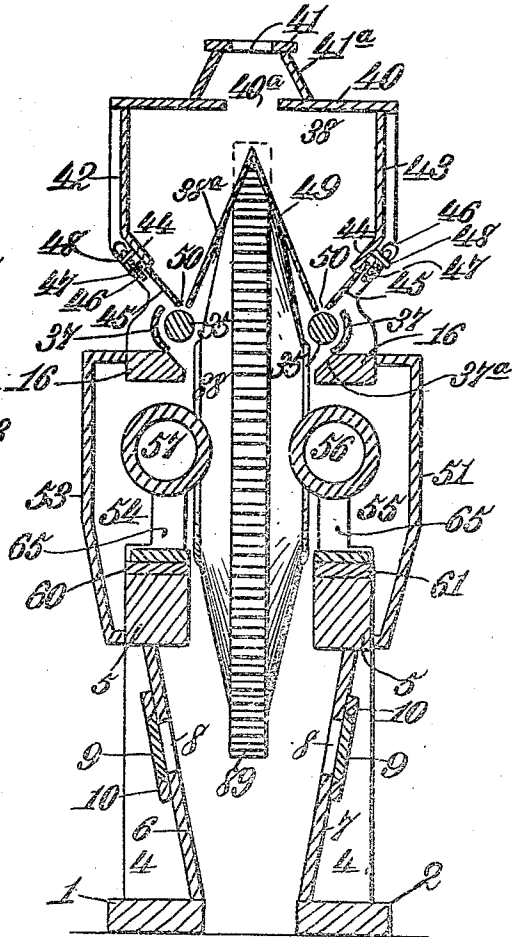


Fig. 4.



Witnesses.
Robert Smith,
J. B. Keeler

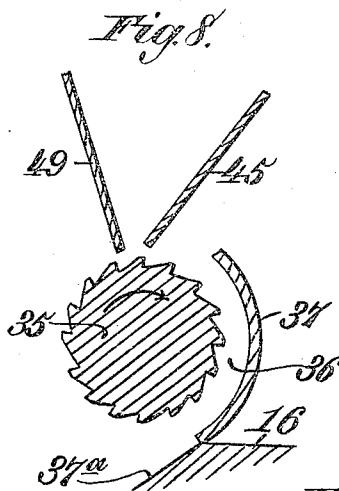
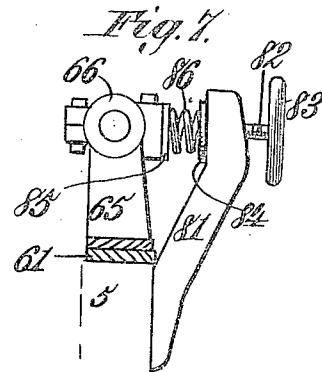
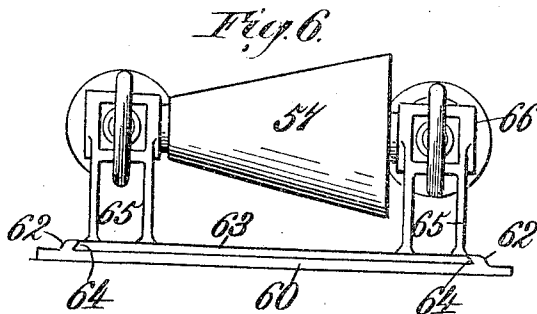
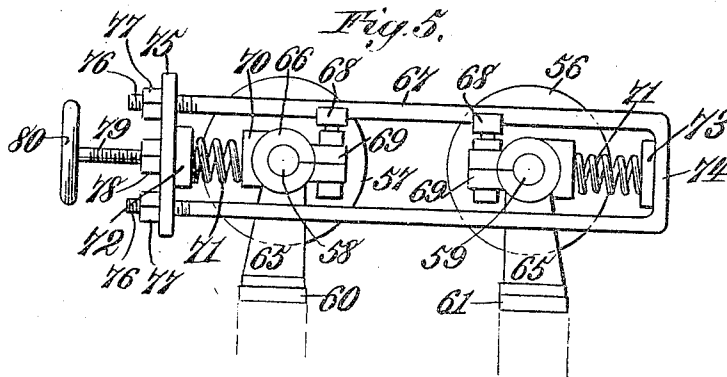
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3 SHEETS—SHEET 3.



Witnesses.
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UNITED STATES PATENT OFFICE.

FRANK H. BROWN AND FRED H. BROWN, OF PORTLAND, OREGON.

GRINDING AND CRUSHING MILL.

958,085.

Specification of Letters Patent.

Patented May 17, 1910.

Application filed August 19, 1908. Serial No. 449,282.

To all whom it may concern:

Be it known that we, FRANK H. BROWN and FRED H. BROWN, citizens of the United States, residing at Portland, in the county of Multnomah and State of Oregon, have invented new and useful Improvements in Grinding and Crushing Mills, of which the following is a specification.

This invention relates to grinding and crushing mills particularly adapted for the preparation of granular or comminuted cereals ordinarily used for foods, and the main object is to provide a mill wherein the grinding or crushing operation is effected with a comparatively small consumption of power and the grinding or crushing action carried on with a minimized formation of flour, the large amount of flour being an objection to the majority of grinding mills now commonly employed for a similar purpose and particularly those utilized for crushing barley for feed.

A further object of the invention is to provide a grinding and crushing mill having a simplified construction of a strong and durable nature, convenient in adjustment, and comparatively inexpensive in its manufacture.

A preferred embodiment of the invention, or one practical form of the machine, is illustrated in the drawings, wherein:

Figure 1 is a side elevation of a grinding and crushing mill embodying the features of the invention. Fig. 2 is a sectional plan view thereof. Fig. 3 is an end elevation. Fig. 4 is a transverse vertical section. Fig. 5 is a detail elevation showing terminal adjusting means for the grinding or crushing rolls. Fig. 6 is a detail elevation particularly illustrating one of the grinding or crushing rolls. Fig. 7 is a detail view illustrating adjusting means for the end of each grinding or crushing roll opposite to that illustrated by Fig. 5. Fig. 8 is a detail sectional view particularly showing a feed roll and its cooperating accessories.

Similar characters of reference are employed to indicate corresponding parts in the several views.

The numerals 1 and 2 designate supporting members which constitute the base of the mill, and on the ends thereof are mounted uprights 3 and 4 having longitudinally extending parallel supports secured to the tops thereof and suitably spaced. The supports 5, uprights 3, 4 and members 1, 2 con-

stitute the frame of the machine. Secured between the one support 5 and the member 1 is a plate 6 which extends downwardly and inwardly; and secured between the other support 5 and the member 2 is a plate 7 which likewise extends downwardly and inwardly, both plates being provided with openings 8, one in each, closed by slides 9 movably mounted in suitable guides 10. The plates 6 and 7 have their inner ends connected by a plate 11 and their opposite ends by a plate 12, the series of plates 6, 7, 11, 12 forming a chamber which receives the crushed grain. Mounted on each of the supports 5 is a block 13 provided with a bearing 14, the blocks connecting with uprights 15 having secured on their upper ends longitudinally extending supporting members 16, each pair of uprights 15 having a single supporting member 16 secured thereto.

The forward ends of the members 5 support bearings 17 in which is journaled a drive shaft 18 carrying on one end a drive pulley 19 adapted to be belted up to a suitable motive means, not shown, the shaft 18 at its opposite end also carrying a power transmitting pulley 20. Fixed to the shaft 18 between the supports 5 is a pinion 21 which constitutes the main driving element for the grinding wheel which will be more fully hereinafter specified. On the rear end of the member 16 bearings 22 are mounted and have a transversely extending power transmitting shaft 23 journaled therein and provided with a pair of beveled pinions 24 held in mesh with a pair of correspondingly beveled pinions 25 fixed to and rotating counter shafts 26. The one end of the shaft 23 is provided with a pulley 27 connected by a belt 28 with the pulley 20 on the one end of the drive shaft 18, the said belt 28 cooperating with a suitable tension or tightening means and comprising an adjustable hanger 29 connected to a plate 31 attached to one of the supporting members 16, the said hanger carrying on its lower end an idler wheel 30 over which the lower portion of the belt 28 has movement. This hanger 29 is formed with a slot 32 through which extends a set-screw 33, the latter engaging the plate 31 and serving to hold the hanger in a fixed adjusted position.

Secured to and extending transversely across the supporting member 16 are sills 34 in which are journaled the shafts 26, each of

said shafts carrying a toothed feed roll 35 having an outer inclosing shield or curvilinear plate 37 extending lengthwise of the roll in each instance and spaced from the said roll to form a passage 36. Each of the plates 37 constitutes a guide in relation to its roll for directing the grain or material to be operated upon to the grinding or crushing elements of the machine. The transversely extending sills 34 and the longitudinally extending plates 37 form a housing for the feed rolls, the inner upper corners of the longitudinal supports 16 being cut away at a downward incline or bevel as at 37^a to provide clearances at the lower extremities of the guide plates 37, the lower ends of said guide plates contacting with the upper surfaces of the supporting members 16, as clearly shown by Fig. 4. The transversely extending sills 34 also serve as a support for a feed hopper, the latter comprising in the present instance front and rear walls 38, 39, side walls 42, 43, and a top 40 having a feed opening therethrough as at 40^a and over which is mounted a hollow feed cap or dome 41^a having a top feed opening 41. The front wall 38 of the hopper is cut away as at 38^a to permit movement of a portion of the grinding wheel into the hopper, and the side walls 42, 43 of the latter are of less height than the said front and rear walls, and each of said walls is provided with an inwardly extending inclined lower terminal 44 having a regulating plate 45 adjustably connected thereto by an exteriorly operated screw-threaded bolt 46 for controlling the discharge of the material from the hopper to the feed rolls at opposite sides of the machine. As shown, each of the plates 45 is inwardly inclined at an angle similar to the lower terminal of the side wall supporting the same, and the screw-threaded bolt 46 for each plate engages a screw-threaded ear 47 projecting from the plate and an apertured ear 48 extending outwardly from the adjacent side inclined terminal 44. The hopper is provided interiorly with an inverted V-shaped partition 49 having its lower terminal edges operatively associated with the lower extremities of the regulating plates 45, the said plates 45 being adjustable toward and away from the lower extremities of the partition 49 to modify the size of the outlet openings 50 between the adjacent edges of the plates and sides of the partition and thus govern the quantity of the grain or material in the hopper falling upon the rolls 35.

Secured to one of the members 16 and the adjacent member 5 is a housing plate or member 51 having angular extremities and side edges as shown by Figs. 2 and 4, and secured to the opposite member 16 and the adjacent member 5 is a corresponding or companion housing plate 53 of similar con-

tour, these plates standing outwardly a sufficient distance to provide practical inclosures for the parts located within the same, and with the adjacent structural features said housing plates form chambers 54 and 55. Within the chambers 54 and 55 are longitudinally disposed conical grinding and crushing rolls 56 and 57, respectively disposed between the members 16 and 5 and having shafts 58 and 59 which are in the form of terminal spindles or stubs. Mounted on the members 5 are guide plates 60 and 61, one on each member, and each plate is provided with a pair of dovetailed flanges 62. The guide plates 60, 61 support bearing brackets for the grinding or crushing roll shafts 58, 59, and as each of these brackets is similar in construction, only one will be described. Each bracket consists of a bottom plate 63 having beveled ends 64, the latter being in engagement with and overlapped by the dovetailed flanges 62 of the guide plates, and formed integral with the bottom plate 63 at each end is an upright 65 provided with a bearing 66 for the reception of the end of one of the grinding or crushing roll shafts. These bearing brackets for the shafts of the grinding or crushing rolls are adjustable toward and away from each other whereby the said rolls may be brought closer to or moved away from the grinding wheel for a purpose which will be more fully hereinafter explained. The mechanism whereby the grinding or crushing rolls can be adjusted embodies means for simultaneously adjusting the rolls at one end and for independently adjusting the rolls at the other end, each of the said means being cushioned to provide a yielding mounting of the grinding or crushing rolls. The means whereby the one set of terminals of the grinding or crushing rolls is simultaneously adjusted consists of a yoke-shaped member 67, see Fig. 5, the said member extending through the rear upright 65 on the bottom plate 63. The top of the yoke-shaped member 67 is mounted upon guide pieces 68 carried by lateral projections 69 formed integral with the bearings 66. Each of the bearings 66 on the rear upright 65 is provided with a flat abutment 70 against which the inner terminal of a compression spring 71 has contact. The springs 71 also engage at their outer extremities with cheek pieces 72, 73 respectively carried by the end 74 of the yoke member and a coupling plate 75 adjustably engaging the extremities of the said member. The arms of the member 61 have their unconnected terminals screw-threaded as at 76 and provided with nuts 77, the opposite extremities of the coupling plate 75 being fitted over the extremities of the arms of the yoke member and having the nuts 77 brought to bear thereagainst. The center of the outer

side of the coupling plate 75 is provided with a screw-threaded boss 78 to receive an adjusting screw rod or stem 79 engaging the adjacent cheek piece 72 and having an operating head or hand grip 80 at its outer extremity.

From the foregoing structural explanation it will be seen that when the rod or stem 79 is disposed in one direction it will cause the grinding or crushing rolls to be simultaneously shifted at one end toward each other, and a reverse adjustment of the rod or stem 79 will result in a movement of the grinding or crushing rolls away from each other. The adjustment of the ends of the grinding or crushing rolls simultaneously is accomplished against the resistance of the spring 71, and by interposing the said spring between the abutment 70 and the cheek piece 72 it is evident that the said grinding or crushing rolls will be permitted to have a yielding movement. The means for individually adjusting the opposite ends of the grinding or crushing rolls consists of an angular arm 81 rising from the adjacent member 5, there being two of the arms or one extending upwardly from each of the members 5; and each arm has extending inwardly through its upper free end an adjusting screw rod or stem 82 provided with an outer manually-operative head or hand-wheel 83 fitted in a boss 83^a, see Fig. 2, and engaging a cheek piece 84 against the inner side of the arm. The adjacent roll shaft bearing is formed with an abutment 85 and between abutment and the cheek piece 84 a compression spring 86 is disposed, there being a like construction in connection with each forward bearing for the respective grinding and crushing rolls to shift the adjacent bracket supporting the bearings for the rolls in opposite directions or toward and away from each other or to bring the forward ends of the rolls in closer relation or farther apart, as the grinding conditions may require. The interposition of the springs 86 sets up a resistance to the adjustment, but said springs give to the adjacent terminals of the shafts of the grinding or crushing rolls a yielding mounting so that the forward ends of the rolls may yield under variations of pressure during the grinding operation.

Journalled in the bearings 14 is a transversely extending shaft 87 carrying a grinding wheel 88 of relatively large diameter with respect to the diameter of the grinding or crushing rolls, the said grinding wheel being formed with conical sides, or, in other words, the opposite sides of the grinding wheel have the contour of truncated cones in reverse relation and with their bases inwardly. The center of the grinding wheel 88 is projected beyond the adjacent inner terminals of the conical sides and formed

with circumferential teeth 89, or the center of this wheel is constructed as a gear to which motion is imparted by the pinion 21 on the shaft 18 and held in continual mesh with the teeth of the grinding wheel to regularly rotate the latter. Owing to the diameter of the pinion 21 relatively to the diameter of the grinding wheel 88, the latter will be revolved at a very much slower rate of speed than the speed of rotation of the said pinion. The grinding or crushing rolls 56 and 57 are held in yielding contact with the grinding wheel 88, but in such close engagement with the latter that the motion of the grinding wheel will revolve the said grinding or crushing rolls, said rolls being frictionally driven through the medium of the conical sides of the grinding wheel with which they contact. The length of each grinding or crushing roll is the same as the distance between the outer and inner limits of the conical side of the grinding wheel with which it engages, and the crushing pressure of each roll with relation to the inclined or conical grinding face of the wheel 88 is maintained equally throughout the length of the roll to render the grinding or crushing action uniform over each face of the grinding wheel. Owing to the duplex structure of the grinding wheel or the provision of the two conical faces it will be seen that the grinding capacity of the single wheel is increased, particularly by using therewith two grinding or crushing rolls, one coöperating with each side or face of the grinding wheel.

At the forward portion of the grinding wheel 88 means are provided for removing matter adhering to the opposite inclined or conical faces or sides thereof after they pass away from the grinding or crushing rolls, and this means consists of a pair of rearwardly and outwardly inclined brushes 90, a single brush engaging each inclined or conical face or side of the grinding wheel. Each brush is carried by an inclined support 91 adjustably connected to a bracket 92 by screws 93, and by this arrangement the brushes can be adjusted toward and away from the inclined or conical sides of the grinding wheel with varying pressure and to take up wear of the brushes by continued use, and by the use of these brushes the grinding sides or faces of the wheel 88 can always be maintained in practical condition and free of accumulations of crushed grain that may adhere thereto or become packed thereon.

Secured between the members 5 at the front and rear are transversely extending spacing bars 94 and 95, and to the center of the bar 94 is attached a housing or casing 96 which incloses the pinion 21 and the teeth 89 of the grinding wheel 88, the upper end of this housing being attached to the feed hopper as shown by Fig. 1. This housing, as

will be understood, shields the teeth of the pinion and grinding wheel and prevents contact or engagement therewith of extraneous objects.

5 In the operation of the mill, motion is imparted to the shaft 18 and through the pinion 21 to the grinding wheel 88, causing the latter to revolve slowly. When the shaft 18 is revolved the pulley 27 will be likewise driven, 10 owing to the belt transmission 28, and the shaft 23 will be consequently actuated to set the feed rolls 35 in motion to feed the grain or other material to be crushed and falling thereon from the hopper downwardly to the 15 inner portions of the crushing rolls 56 and 57, and as the latter are rotated inwardly toward the grinding wheel, owing to the movement of the said wheel in a direction to cause such inward rotation of the rolls 56 20 and 57, the grain or other material will be drawn inwardly between the crushing rolls and the grinding wheel and after being subjected to the crushing action of the grinding wheel and rolls the material will fall 25 into the chamber at the bottom of the frame of the machine or between the plates 6 and 7, whence it can be removed or conducted to any desired point. Likewise any matter adhering to the inclined or duplex conical sides 30 of the grinding wheel is removed by the brushes or cleaners 90 and falls into the bottom receiving chamber, the latter being projected far enough forwardly for this purpose.

Having thus described the invention, what 35 is claimed as new, is:

A mill of the class described embodying a grinding wheel of large diameter having reversely inclined sides equally sloping from the center convergingly to the periphery of 40 the wheel, the said grinding wheel having teeth disposed in the center between the inclined sides and extending fully around the periphery of the same, a shaft fixed to the grinding wheel to rotate therewith and having 45 suitable bearings, gear means coöperating with the peripheral teeth to rotate the said wheel and shaft, conical grinding or crushing rolls arranged in operative relation with respect to the two inclined faces of the 50 grinding wheel, means for unitedly adjusting the rolls relatively to the grinding wheel, means for independently adjusting the rolls relatively to the grinding wheel, and means 55 for feeding material to be ground to the points of contact of the grinding or crushing rolls and the grinding wheel, the grinding or crushing rolls being rotated inwardly toward the grinding wheel by frictional contact with the latter. 60

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

FRANK H. BROWN.
FRED H. BROWN.

Witnesses:

R. E. MENEFEE,
MINNIE HILL.