June 11, 1935. O. N. GREDELL 2,004,753

COMBINATION CUTTING AND GRINDING MILL

Filed March 12, 1932 4 Sheets-Sheet 1

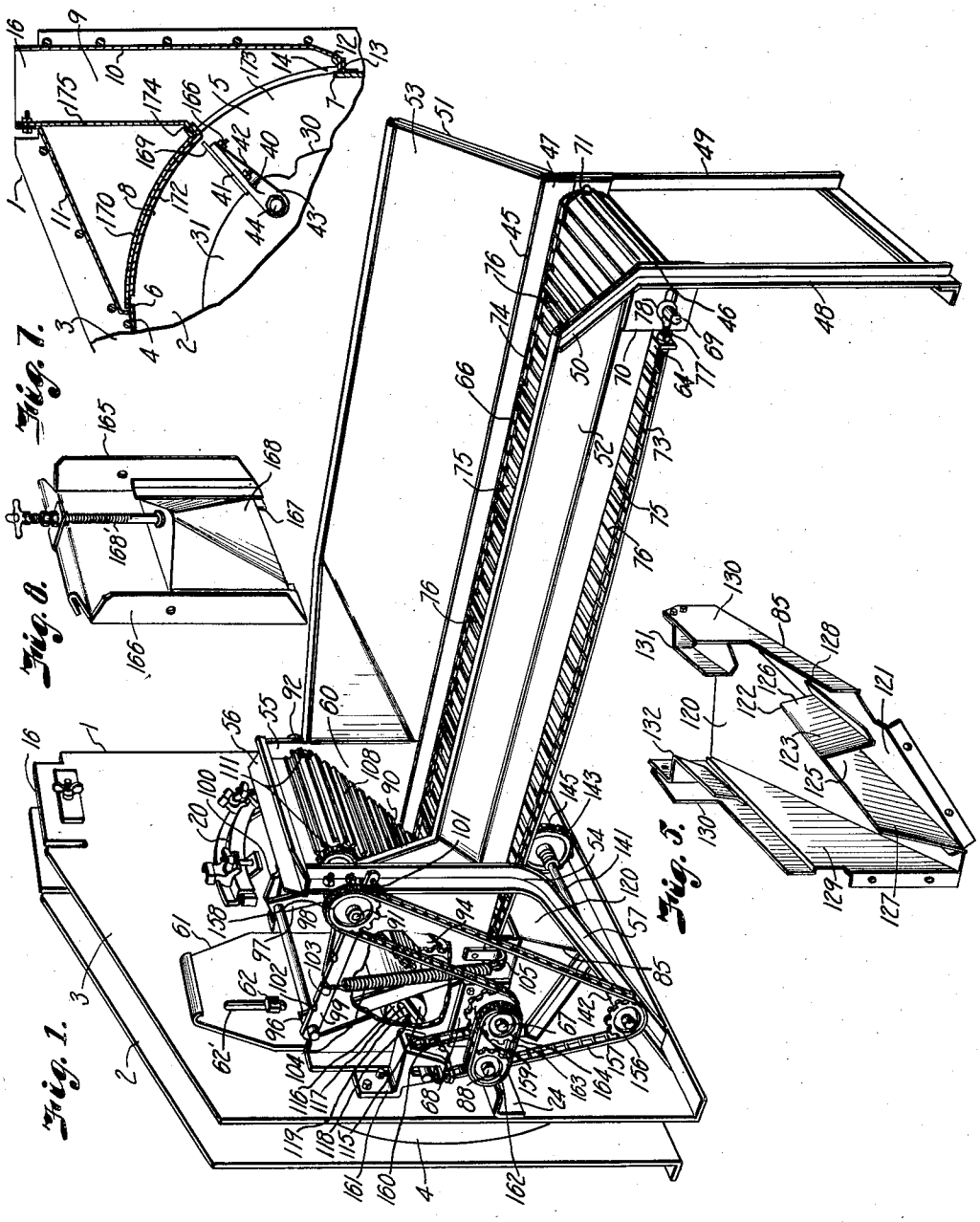


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

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COMBINATION CUTTING AND GRINDING MILL

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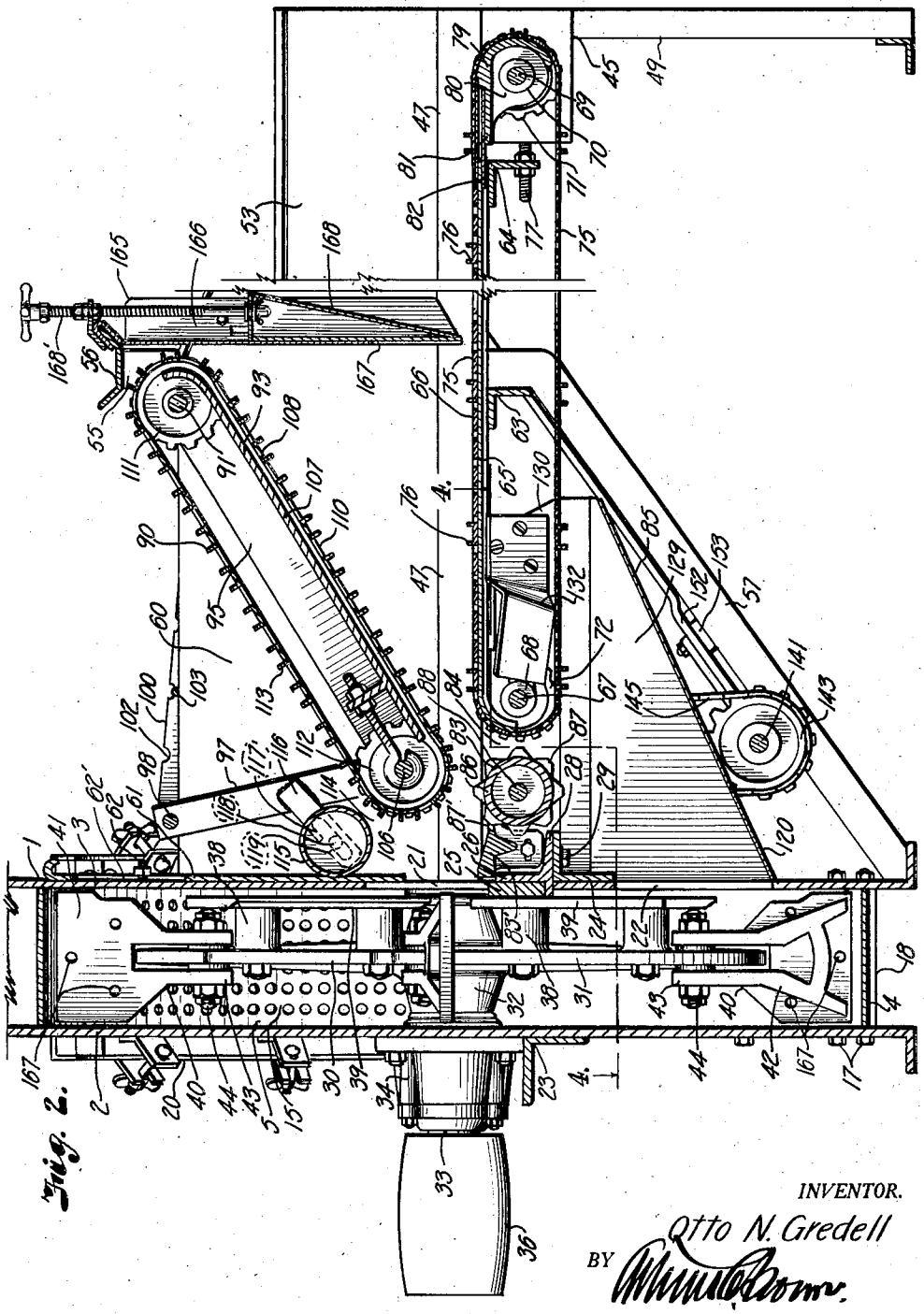


Fig. 2.

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COMBINATION CUTTING AND GRINDING MILL

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Fig. 4.

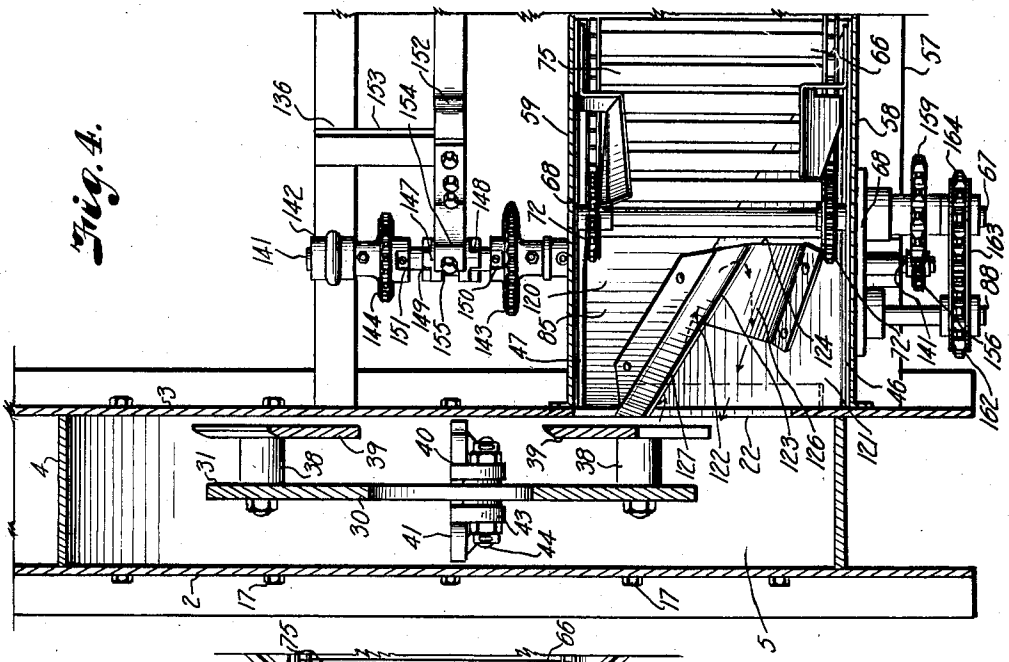


Fig. 3.

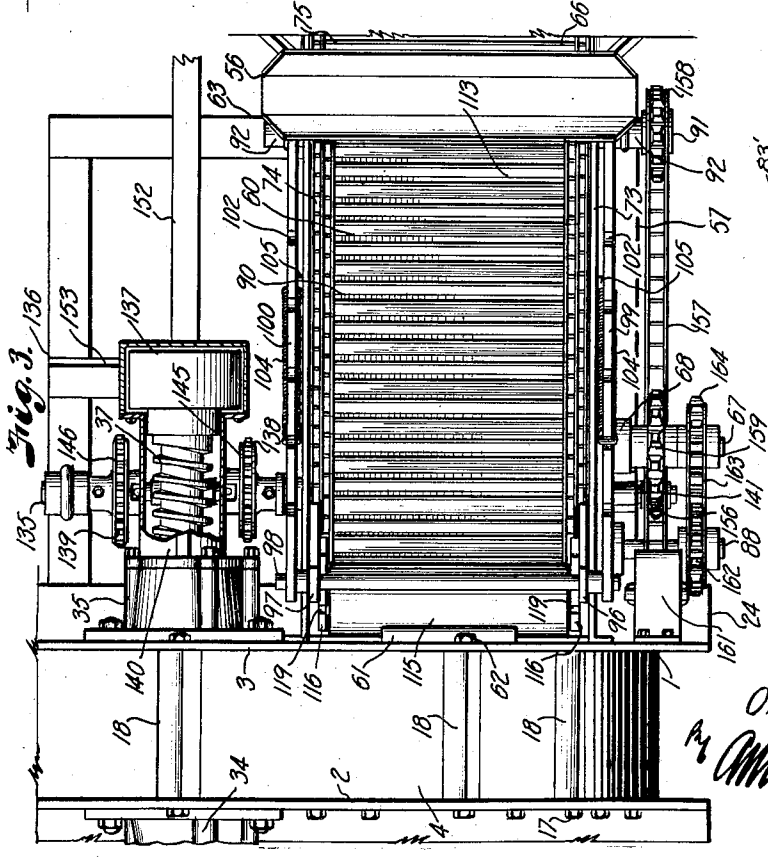
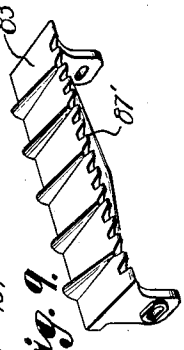


Fig. 9.



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COMBINATION CUTTING AND GRINDING MILL

Filed March 12, 1932 4 Sheets-Sheet 4

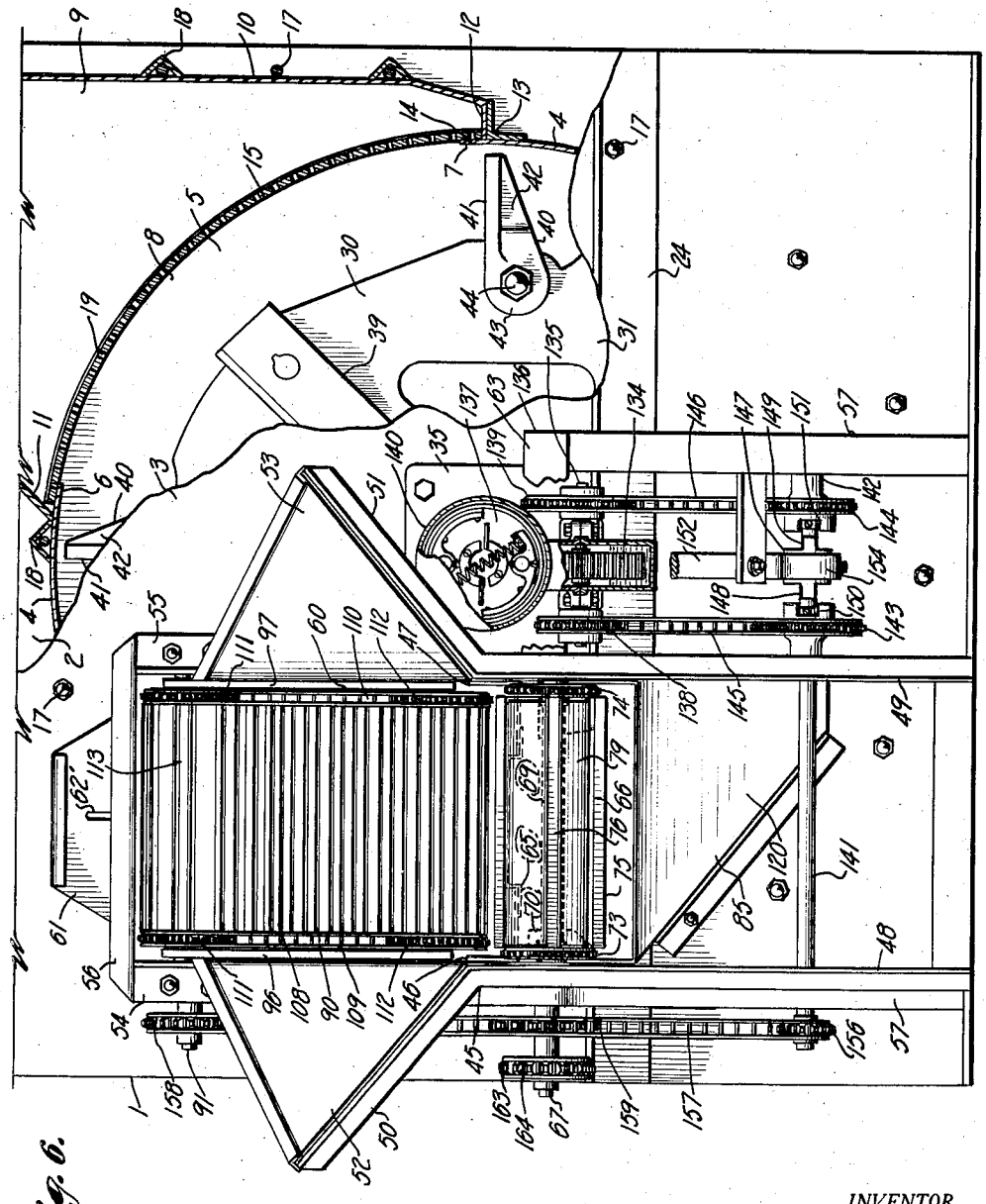


Fig. 6.

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UNITED STATES PATENT OFFICE

2,004,753

COMBINATION CUTTING AND GRINDING MILL

Otto N. Gredell, Kansas City, Mo., assignor to Standard Steel Works, North Kansas City, Mo., a corporation of Missouri

Application March 12, 1932, Serial No. 598,407

4 Claims. (Cl. 146—107)

This invention relates to combination cutting and grinding mills and more particularly to those of the rotary knife and hammer type, and has for its principal object to provide a machine which will economically reduce all classes of feeds such as the various grains, fodders, hay and ensilage, as well as other similar materials, either separately or in combination as in the preparation of mixed stock feeds.

Other important objects of the invention are to provide automatic feed of the material to the reduction chamber proportional to its rate of reduction and delivery therefrom, to prevent spilling of small grain by the feeding mechanism, to by-pass small grains and foreign objects so that they will not come into shearing contact with the knives, and to provide for quick conversion from the grinding of grains to a set-up for cutting and elevating ensilage.

In accomplishing these and other objects of the invention, I have provided improved details of structure, the preferred forms of which are illustrated in the accompanying drawings, wherein:

Fig. 1 is a perspective view of a combination cutting and grinding mill and feeding mechanism constructed in accordance with my invention.

Fig. 2 is an enlarged longitudinal sectional view through the machine particularly illustrating the feeding mechanism for delivering material to the reduction chamber of the mill.

Fig. 3 is a plan view of a portion of the grinding mill and the feeding mechanism associated therewith.

Fig. 4 is a detail sectional view on the line 4—4, Fig. 2, particularly illustrating the hopper for discharging small grains into the reduction chamber and the baffle for preventing reduced material from blowing back into the hopper.

Fig. 5 is a detail perspective view of the hopper for delivering small grains to the reduction chamber.

Fig. 6 is a side elevational view of the machine, a part of the reduction chamber housing being broken away to better illustrate the screen covering the outlet passage from the reduction chamber.

Fig. 7 is a detail view illustrating the grinding mill after it has been converted for cutting ensilage.

Fig. 8 is a detail perspective view of the cut-off gate assembly which controls the amount of small grain delivered by the conveyor mechanism.

Fig. 9 is a perspective view of the plate which bridges the space between the feed roller and the fixed shear bar.

Referring more in detail to the drawings:—

1 designates a grinder casing including vertical side plates 2 and 3 spaced apart by a substantially circular band 4 to form a cylindrical reduction chamber 5. The ends 6 and 7 of the band terminate short of each other to provide an arcuate outlet 8 arranged to discharge material at the upper periphery of the reduction chamber into an exhaust chamber 9.

The exhaust chamber is defined by upwardly extending portions of the side plates and by spaced cross plates 10 and 11 having the width of the band 4. The plate 10 extends substantially vertically between the side plates at a point spaced outwardly from a vertical tangent to the circular band, and its lower end is bent inwardly at an angle to connect with the band and to form a flange 12 for seating on an angle member 13 extending across the outer face of the band adjacent the end 7 thereof. The angle member is spaced below the end of the band to form a screen-engaging ledge 14 for a screen 15 later described.

The other plate 11 has its lower end engaging the opposite end, but is spaced from its edge 6 to form a screen seat for cooperating with the ledge 14 of the band. The other end of the plate is inclined upwardly toward the plate 10 to form therewith a discharge neck 16 to connect a suitable discharge conduit (not shown).

The band 4, including the plates 10 and 11, is clamped in position between the side plates 2 and 3 by bolts 17, certain of the bolts extending through triangular-shaped loops 18 that are welded to said members, as best illustrated in Fig. 6.

The screen 15 preferably comprises an arcuate plate conforming to the curvature of the band, and is provided with a plurality of openings 19 through which the material is discharged into the exhaust chamber. The screen plates are removable to permit the insertion of screens having openings 19 of suitable size to control the degree of fineness of material discharged from the reduction chamber, which, of course, depends upon the nature of the material being ground and the purpose for which it is used.

The ends of the screen rest upon the ends of the band 4, while the side edges thereof extend through suitable slots in the side plates and are clamped by arcuate clamping plates 20 which form the subject matter of a co-pend-

ing application, Serial No. 561,173, now matured into a patent, No. 1,928,887.

Formed in the side plate 3 at the side opposite to the screen 15 and at a point intercepting the horizontal diameter of the reduction chamber is a substantially rectangular main inlet opening 21 through which roughage material is discharged into the reduction chamber, as later described. Also formed in the side plate 3 at a point spaced directly below the opening 21 is a substantially triangular-shaped auxiliary opening 22 through which small grains and foreign objects are bypassed into the reduction chamber. Fixed to the outer faces of the side plates 2 and 3 and extending thereacross are horizontally positioned angle bars 23 and 24, respectively. The bar 24 extends across the plate 3 between the spaced openings 21 and 22 to support a knife or shear bar 25 adjacent the lower edge of the opening 21. The shear bar is secured to the vertical leg 26 of an angle member 27 having its opposite leg 28 secured to the horizontal leg of the angle 24 by suitable fastening devices such as the bolts 29 illustrated in Fig. 2.

The shear bar 25 is thus supported in rigid position across the bottom edge of the inlet opening 21 to cooperate with rotating knives carried on a rotor 30.

The rotor 30 includes a disk 31 having a central hub 32 through which a shaft 33 is extended to mount the rotor within the reduction chamber, the ends of the shaft 33 being mounted in suitable bearings 34 and 35 secured to the side plates 2 and 3, respectively.

The ends of the shaft 33 project through the bearings and the end adjacent the bearing 34 is provided with a pulley 36 through which power is applied to operate the rotor from a suitable prime mover, not shown, while the other end mounts a worm gear 37 for operating the material feeding mechanism later described.

Extending from the face of the rotor disk adjacent the plate 3 are pairs of radially spaced bosses 38 for mounting knives 39 adapted to cooperate with the shear bar 25 for cutting material delivered through the inlet opening 21. The periphery of the rotor disk is provided with a plurality of hammer-like plates 40 which cooperate with the inner face of the band 4 and screen 15 to further reduce the material to the fineness where it will pass through the screen. The hammer blades 40 preferably include body portions having flat forward faces 41 of sufficient width to extend substantially across the width of the reduction chamber and of sufficient length to retain the material in grinding contact with the inner periphery of the chamber.

The back faces of the hammer-like blades are provided with spaced ribs 42 terminating in ears 43 straddling the edge of the disk and forming means by which the hammers are pivotally mounted by bolts 44 extending through the ears and through suitable openings in the disk. The flat faces of the hammers also serve as fan blades to draw air through the inlet openings and to create a blast for forcing the material through the screen and exhaust chamber.

The feeding mechanism forms an important part of the present invention, and comprises a structural framework 45 including spaced angle bars 46 and 47 extending laterally from the plate 3 at opposite sides of the inlet opening 21. The outer ends of the angle bars are supported by vertical angle-shaped legs 48 and 49 having their lower ends engaging the ground while their upper ends are bolted to the ends of the angle bars and diverge outwardly to form inclined side boards 52 and 53 extending upwardly and outwardly along the vertical legs of the spaced angle members 46 and 47 to form guides for the material as it is delivered to the reduction chamber. The opposite ends of the side boards 52 and 53 are drawn inwardly at their forward ends to substantially the spacing of the bars 46 and 47, and are supported by vertical angle bar posts 54 and 55 attached to the spaced bars at a point spaced from the grinder housing. The upper ends of the posts 54 and 55 are braced by a connecting cross member 56 while their lower ends, from the points where they attach to the angle members 46 and 47, incline toward the bottom edge of the plate 3 to connect therewith and form braces 57 for supporting the intermediate portions of said bars 46 and 47.

Extending upwardly from the angle bars 46 and 47 and connecting the terminals of the side boards 52 and 53 with the side plate 3 are spaced side board extensions 58 and 59 forming a feed chamber 60 therebetween. The ends of the plates 58 and 59 opposite the posts 54 and 55 are flanged laterally and are secured to the side plate 3.

Slidable between the side plates 58 and 59 is a damper 61 adapted to control the effective air inlet area of the inlet 21 to control the volume and velocity of the air admitted therethrough. The damper 61 is slidably fixed to the side plate 3 by a bolt 62 projecting through a slot 62' formed in the upper portion thereof, as illustrated in Figs. 1 and 2.

Connecting the angle bars 46 and 47 adjacent their outer ends at a point in alignment with the posts 54 and 55 are cross tie members 63 and 64, respectively, each including angle bars having one of their flanges extending horizontally to provide supports for cooperating with the inwardly extending flanges of the members 46 and 47 to support a horizontal floor plate 65 for a conveyor 66.

The conveyor 66 includes a forwardly positioned shaft 67 supported in bearing plates 68 depending from the longitudinal angle bars 46 and 47 at a point spaced from the side plate 3 of the reduction chamber, and a complementary shaft 69 having its ends slidably supported in plates 70 located at the opposite ends of the angle bars, the respective shafts being provided with pairs of sprockets 71 and 72 located thereon adjacent the side boards 52 and 53 for mounting chains 73 and 74 forming the sides of an endless raddle.

The raddle preferably includes interlocked cross slats 75 connecting the chains and spaced channel-shaped cleats 76 positioned at suitable intervals to effect positive feed of material to the reduction chamber. The upper run of the raddle operates over the floor plate 65 toward the feed chamber, while the lower run returns under the table as illustrated in Fig. 2.

The raddle thus described is tensioned between the sprockets to take up the slack therein by moving the shaft 69 to and from the shaft 67. This adjustment is accomplished by threaded draw bolts 77 adjustably mounted in the depending flange of the angle 64 and having ring-shaped ends 78 for engaging over the ends of the shaft.

In order to provide a guide for the end of the conveyor raddle where it rounds about the sprockets 71, I provide a curved shoe 79 supported by the shaft by means of depending webs 80 provided with bearing openings through which the shaft 69 is extended.

The shoe member 79 includes a forwardly projecting shelf portion 81 for supporting a cross plate 82 slidable below the end of the plate 65 and above the tie member 64, so that when the shaft 69 is adjusted to vary the tension of the raddle, the plate 82 underlapping the floor plate prevents small grains from dropping through the raddle.

As previously pointed out, the delivery end of the raddle is spaced from the inlet opening 21 to accommodate a stripping roller 83 for stripping the raddle of material that may tend to carry over with the lower run thereof, and to provide a passageway 84 through which small grains are by-passed into a hopper 85 suspended from the side members 46 and 47, as best illustrated in Figs. 2 and 6.

The stripping or feed roller 83 includes a cylindrical body 86 having a plurality of rows of teeth 87 extending about its periphery to engage the roughage materials, such as hay and fodder that may be delivered to the reduction cylinder. The feeder 83 is keyed to a shaft 88 that is rotatably mounted in the bearing plates 68 previously described.

Supported and bridging the space between the feed roller 83 and the shear bar 25 is a plate 83' having teeth 87' to extend between the teeth 87 of the roller to remove material that may tend to lodge thereon.

Swingingly mounted in the feed chamber above the feed roll and the conveyor 66 is a secondary feed raddle 90 for forcing material into contact with the stripping roller and through the inlet opening, as now described. The raddle 90 includes a pivot shaft 91 extending across the upper rear edges of the side board extensions and having its ends rotatably mounted in bearings 92 carried at the upper ends of the posts 54 and 55.

Pivotally mounted on the shaft 91 and operable between the side board extensions is a raddle frame 93 including side bars 94 and 95 having their rear ends swingingly supported on the shaft 91, while their forward ends are normally suspended from the upper edge of the side board extensions by links 96 and 97. The links 96 and 97 are supported at their upper ends by a rod 98 having its ends normally resting on the upper edge of the side boards to limit downwardly swinging movement of the secondary raddle to prevent contact thereof with the conveyor 66 previously described.

Fixed to the ends of the rod 98 are lever arms 99 and 100 having their ends projecting rearwardly along the side boards and pivotally mounted in slots 101 that are formed in the flanges of the angle posts 54 and 55, as illustrated in Fig. 1. The lever arms are provided along their upper edges with a series of notches 102 for engaging the hooked ends 103 of tension springs 104 that are connected at their lower ends with brackets 105 carried by the side members 46 and 47, as best illustrated in Fig. 1.

The raddle 90 also includes a shaft 106 rotatably mounted in the lower ends of the arms 94 and 95. The shaft is preferably slidable in suitable slots in the ends of the side bars by adjusting screws similar to the adjusting screws 77, whereby it may be adjusted to and from the shaft 91 to tension the raddle.

Supported at the lower edges of the bars 94 and 95 is a backing plate 107 over which the lower run of the raddle 108 operates. The raddle 108 includes side chains 109 and 110 operable over pairs of sprockets 111 and 112 fixed to the ends of the shaft 91 and 106, respectively. The chains 109 and 110 are connected by cross slats 113 similar to those of the main raddle previously described.

It is, therefore, apparent that the springs tend to retain the forward end of the secondary feed raddle in depressed position, substantially closing off the opening to the reduction chamber, and that the material being fed by the primary conveyor must raise the raddle 90 against tension of the springs 104 to be forced through the inlet opening. The tension of the springs may be regulated by moving the ends thereof to any one of the notches which varies the effective leverage on the arms, to apply pressure to the material being fed to the reduction chamber.

In order to close the space 114 which is necessary between the side plate 3 of the reduction chamber and the end of the secondary raddle, I provide a roller 115 having its ends floatingly mounted in bracket arms 116 that are welded to the suspension links 96 and 97 at a point above the raddle. The ends of the brackets 116 are provided with elongated slots 117 to accommodate movement of the roller and to form guide tracks for the roller trunnions 118. The brackets 116 are provided with notches 119 opening to the slots 117 through which the trunnions may be inserted. The roller 115 is arranged to move in rolling contact with the control damper 61 so that as the secondary raddle swings on its pivotal mounting the opening between the end thereof and the reduction chamber will remain closed to prevent the upper run of the secondary raddle from carrying back material and to serve as a baffle for deflecting material that may be thrown back from the reduction chamber.

The hopper 85 is best illustrated in Figs. 2, 4 and 5, and includes a sloping bottom 120 extending from the under side of the primary raddle to the lowermost edge of the opening 22 for gravitating the grain discharged through the passage 84 into the reduction chamber. The bottom 120 also includes a laterally inclined portion 121 having its rear end extending along the inclined edge portion of the opening 22, and mounts a deflector for trapping material reduced in the grinding chamber.

The deflector 122 includes an inverted trough-shaped portion 123 forming a ridge having a closed rear end 124 forming a pocket 125 with the inclined walls 126 and 127 of the baffle. The side wall 127 of the baffle preferably extends to the delivery edge of the hopper in order to prevent the air blast from blowing small grain back into the hopper.

The hopper includes vertical side members 128 and 129 having upward extensions 130 that are bolted to the longitudinal frame members 46 and 47. The upward extensions 130 are also provided with guard plates 131 and 132 for guiding grain that may tend to pass through the slots that are necessary to accommodate the sprockets 72 from dropping onto the lower run of the raddle and being carried back thereby.

In order to drive the feed mechanism, the worm 37 on the rotor shaft 33 is meshed with a

worm gear 134 carried on a jack shaft 135 that is rotatably mounted in a lateral extension 136 of the conveyor frame. The worm is provided with a suitable governor mechanism indicated at 137, which acts to automatically disconnect the worm from driving connection with the rotor shaft when the rotor speed is reduced below a certain R. P. M. to stop feed of material until the rotor again attains its normal working speed.

The specific construction of the clutch and governor form no part of the present invention, but constitute subject matter of a separate application.

The shaft 135 is provided with a pair of sprockets 138 and 139 at opposite sides of the worm gear housing 140, the sprockets 138 and 139 being of differential diameter in order to furnish a plurality of speeds for driving a countershaft 141 which is rotatably mounted in bearings 142 carried by the brace portions of the posts 54 and 55.

The countershaft 141 is provided with sprockets 143 and 144 aligning respectively with the sprockets 138 and 139, and driven by chains 145 and 146 operating over the respective sprockets. The sprockets 143 and 144 are loosely mounted on the countershaft 141 but are adapted to be selectively connected therewith by a sliding clutch collar 147 having oppositely facing clutch teeth 148 and 149 to engage clutch faces 150 and 151 on the respective sprockets. The clutch collar is actuated by a shifting lever 152 pivoted adjacent the collar on a bracket arm 153 supported by the frame extension, as best illustrated in Figs. 2 and 6, the lower end of the shifting lever being provided with a yoke 154 engaging in a circumferential groove 155 of the collar. The opposite end of the arm projects rearwardly along the side of the primary conveyor frame in easy reach of the operator.

The opposite end of the countershaft is provided with a sprocket 156 for driving a chain 157 operating over a sprocket 158 on the end of the secondary conveyor pivot shaft 91, over a sprocket 159 on the end of the primary conveyor shaft 67, and over an idler tensioning sprocket 160. The idler sprocket is carried in a bracket 161 supported by the side plate 3 of the grinding mill.

In order to drive the stripping roller 83, it is provided with a sprocket 162 which is operated by a chain 163 running over a sprocket 164 mounted on the conveyor shaft 67 alongside of the sprocket 159.

It is thus apparent that the countershaft, through the sprockets 156, 158 and 159, and chain 157, drives the primary and secondary raddles while the sprockets 162 and 164 operate the stripper or feeding cylinder through the chain 163.

To operate a grinder and feeding mechanism constructed and assembled as described, and assuming that roughage material, such as corn fodder, stalks or ear corn, is to be ground, a screen 15 having the proper size openings is inserted through the arcuate slots in the sides of the housing and secured in place by the clamping plates 20. The pulley 36 is belted to a suitable prime mover to actuate the rotor 30 and the worm 37 on the rotor shaft, which in turn operates the worm gear and the jack shaft 135. The damper 61 is positioned to regulate the air volume and the proper tension is applied to the secondary raddle 90 by moving the hooked ends of the springs 104 to the proper notch 102 in the lever arms 99 and 100. The clutch control lever 152 is then moved to engage either of the sprockets 143 or 144 depending upon the conveyor speed desired. The speed at which the material can be fed is governed by the degree of dryness thereof, as well as the rate of reduction and clearance through the screen.

Upon engagement of the clutch with either one of the sprockets, the countershaft 141 begins rotation to drive the chain belt 157 to actuate the sprocket 158 on the secondary raddle shaft 91 and the sprocket 159 on the main raddle shaft 67 to operate the respective raddles in a direction to feed the material toward the reduction chamber.

Rotation of the main conveyor shaft 67 effects rotation of the stripping cylinder through the chain 163 and sprockets 162 and 164 on the shaft 67 and the shaft of the stripping cylinder, respectively, rotating the stripping cylinder in an anti-clockwise direction (Fig. 2), to prevent the fodder from following the lower run of the raddle. The fodder is then fed in suitable quantities on the upper run of the main raddle. Moving of the raddle causes the cleats 76 to engage the fodder and advance it toward the secondary raddle 90.

The fodder, on being engaged by the raddle 90, is pressed in close contact with the upper run of the main raddle and the stripping cylinder 83 which then draws the fodder from the raddles and feeds it through the inlet opening of the reduction chamber. On passage of the material under the secondary raddle it will swing the raddle on its pivot shaft 91 an amount proportionate to the tension of the springs 104. During the upward movement of the secondary raddle, the cylinder 115 rolling in contact with the side of the feeder housing will maintain the space 114 closed against the escape of fodder which may tend to blow back or be carried backwardly by the upper run of the secondary raddle. As the fodder passes the shear blade 25 it will be cut into short lengths by the rotating knives 39 on the rotor.

Rotation of the rotor causes a stream of air to be drawn through the inlet openings to cooperate with the raddles and stripping cylinder in feeding the material into the reduction chamber. The cut material, when caught in the swirling air created by the hammers, is directed to the inner periphery of the band 4 by centrifugal force of the revolving mass, where it is engaged by the hammers 40 and reduced by grinding impact thereof against the screen until it is of sufficient fineness to pass therethrough aided by the blast of air discharged through the exhaust passageway.

Should foreign matter, such as wire etc., be delivered onto the main raddle, it will drop off the end thereof into the hopper 85 where it will gravitate through the opening 22 into the reduction chamber, thereby by-passing the shearing point of the knives 39 and shear bar 25.

Should it be desired to provide a mixed feed, including small grains and fodder, the small grains may be delivered onto the main conveyor along with the fodder, but these grains on reaching the end of the raddle will drop through the passageway adjacent the stripping cylinder into the hopper 85, where they will gravitate through the opening 22 in the reduction chamber, while the fodder or roughage material will

continue through the opening 21 to be cut into small pieces.

Due to the position of the opening 22, some of the reduced material may tend to blow back therethrough into the hopper 85, but this is prevented by the pocket-shaped deflector 122 which effects eddy currents that tend to return the material back into the reduction chamber.

Assuming that only small grains are to be delivered to the reduction chamber, a cut-off gate assembly 165 is applied in front of the secondary raddle, as illustrated in Figs. 2 and 8. The gate assembly includes a frame 166 supported across the conveyor and is provided with an opening 167 controlled by a gate 168 movable to and from the upper run of the raddle by a screw 168'. It is thus apparent that the gate controls the amount of grain delivered thereunder for discharge through the opening 84 into the hopper 85, where it gravitates through the inlet opening 22.

When the machine is to be used for cutting ensilage, the hammers 40 are provided with extension plates 169 that are secured to the flat faces of the hammers by bolts 170 (Fig. 7) extending through suitable openings 171 provided in the hammers. The screen 15 is also removed and a short arcuate plate 172 is inserted in place thereof.

The plate 172 has one end resting against the ledge formed by the ends 6 of the band 4 with its sides supported in the arcuate slots of the side plates 2 and 3. Its opposite end terminates short of the plate 10 to provide a relatively narrow discharge opening 173 that is located tangentially of the reduction chamber adjacent the plate 10. The lower end of the arcuate plate is provided with a channel-shaped groove 174 for securing the end of a plate 175 extending parallel with the plate 10 to narrow the exhaust chamber. The open upper end of the exhaust chamber may be connected by a suitable distributing conduit (not shown) for elevating the ensilage to the top of a silo or the like. Otherwise the structure is identically the same as when the machine is used for grinding grains or roughage material, the longer blades being required to obtain the proper velocity for the air stream to elevate the ensilage.

Should the feed of material be such as to deliver larger quantities to the reduction chamber than the rotor can efficiently handle, its speed will be reduced, thereby causing the governor mechanism to disengage the worm with the rotor shaft, stopping operation of the feed raddles until the overloaded reduction chamber has been relieved, or until the passageways through the screen have been cleared, at which time the rotor will again pick up its speed to cause the governor mechanism to again effect operation of the conveyors to continue feed of material.

From the foregoing it is apparent that I have provided a feeding and grinding mechanism which is well adapted for all classes of feeds and ensilage, and that the hopper 85, together with the passageway at the end of the main raddle, forms a by-pass for foreign objects that may be delivered with material to be reduced, thereby preventing damage to the cutting knives.

What I claim and desire to secure by Letters Patent is:

1. In a machine of the character described, a casing having substantially vertically spaced openings therein for admitting forage and grain respectively, a rotor in the housing for reducing the material delivered through said openings, a conveyor supported in feeding relation with said openings for delivering forage material directly to the upper opening, a hopper supported below the conveyor and in covering relation with the lower opening having an inclined bottom sloping downwardly and laterally toward said opening so that grain discharged from the conveyor is delivered by the hopper in the direction of rotation of said rotor to prevent rotation of the rotor from interfering with the delivery of the grain, and an inverted trough shaped baffle member fixed to the bottom of said hopper for stopping and diverting air blasts generated by said rotor to prevent their interference with the grain delivery into the casing.

2. In apparatus of the character described, including a housing, a primary conveyor for feeding material toward the housing, means supporting the delivery end of the primary conveyor in spaced relation with the housing, a stripper member rotatably mounted between the housing and the delivery end of the primary conveyor for removing material therefrom and discharging it into the housing, a secondary conveyor, a shaft for supporting the forward end of the secondary conveyor above the primary conveyor, lever arms mounted adjacent said shaft, a cross rod carried by the lever arms, strap members fixed to the cross rod, a shaft rotatably carried by the strap members for supporting the opposite end of the secondary conveyor above the stripper member whereby said secondary conveyor acts to move material from the primary conveyor across the stripper member, a cylinder carried by said straps and rollingly engaged with the housing to prevent material from being carried back by the secondary conveyor and yielding means connected with said lever arms for yieldingly retaining the secondary conveyor in contact with material fed across said stripper member.

3. A grinder for preparing mixed forage and grain feeds including a cylindrical housing forming a rotor chamber having upper forage and lower grain inlets in a side thereof and having an outlet for ground material in the periphery thereof, a screen covering the outlet, a rotor mounted in the chamber, knives on the rotor, a knife fixed in the housing at the forage inlet and cooperating with the rotor knives, a conveyor connected with the housing for delivering mixed forage and grain toward said inlets, means cooperating with the conveyor to deliver the forage through said forage inlet for initial reduction by the knives, hammer blades on the rotor cooperating with the screen to grind the initially reduced forage in the rotor chamber, a hopper mounted below the conveyor and connected with the grain inlet for receiving grain from the conveyor and discharging said grain into the rotor chamber for direct reduction by the hammers whereby the grain and the initially reduced forage are ground and mixed in conformity to the rate of feed of said material by the conveyor, and a pocket shaped deflector in the hopper for trapping and returning reduced materials that are blown from said grain inlet under fanning influence of the rotor.

4. A grinder for preparing mixed forage and grain feeds including a cylindrical housing forming a rotor chamber having upper forage and lower grain inlets in a side thereof and having an outlet for ground material in the periphery thereof, a screen covering the outlet, a rotor

mounted in the chamber, knives on the rotor, a knife fixed to the housing at the forage inlet and cooperating with the rotor knives, a conveyor connected with the housing for delivering mixed forage and grain toward said inlets, means cooperating with the conveyor to deliver the forage through the forage inlet for initial reduction by the knives, hammer blades on the rotor cooperating with the screen to grind the initially reduced forage in the rotor chamber, a hopper mounted below the conveyor and connected with the grain inlet for receiving grain from the conveyor and having an inclined bottom portion sloping downwardly and laterally toward a vertical plane through the axis of the rotor for directing the grain into the rotor chamber in the direction of rotation of the rotor for direct reduction by the hammers whereby the grain and initially reduced forage are ground and mixed in conformity to the rate of feed of said materials by the conveyor.

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