

W. F. & G. J. MOORE.
GRAIN GRINDING MACHINE.
APPLICATION FILED OCT. 27, 1913.

Patented Apr. 13, 1915.

3 SHEETS—SHEET 1.

1,135,313.

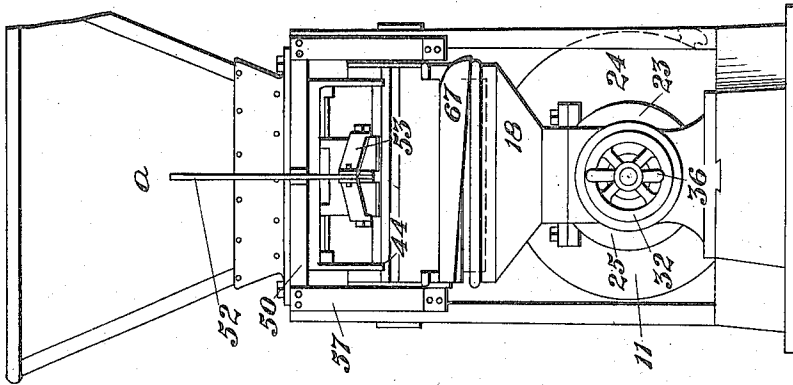


Fig. 2

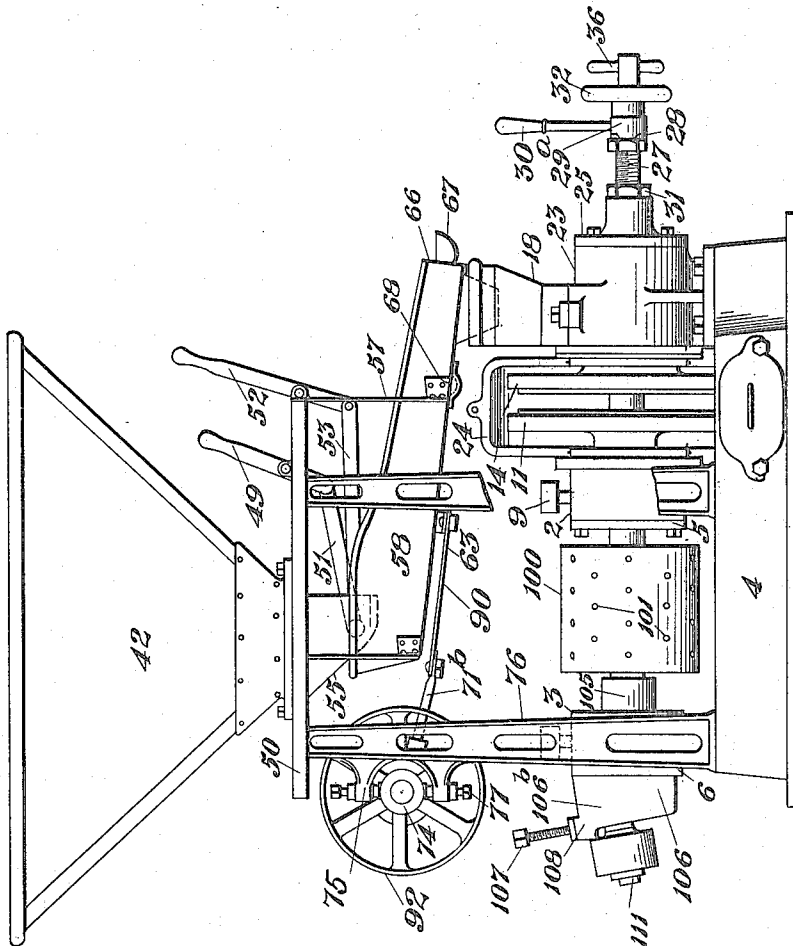


Fig. 1

WITNESSES

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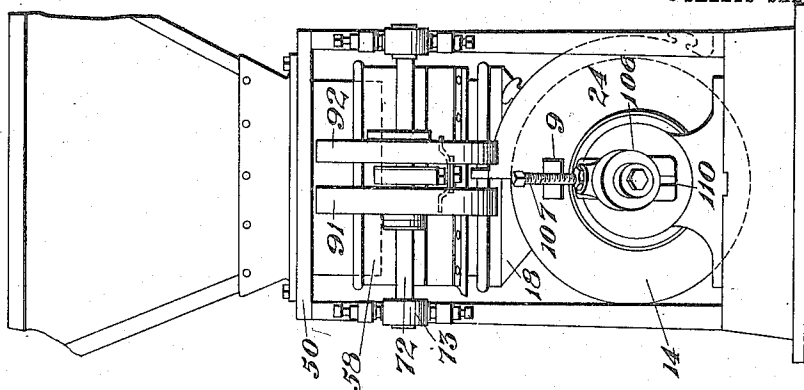


Fig. 3

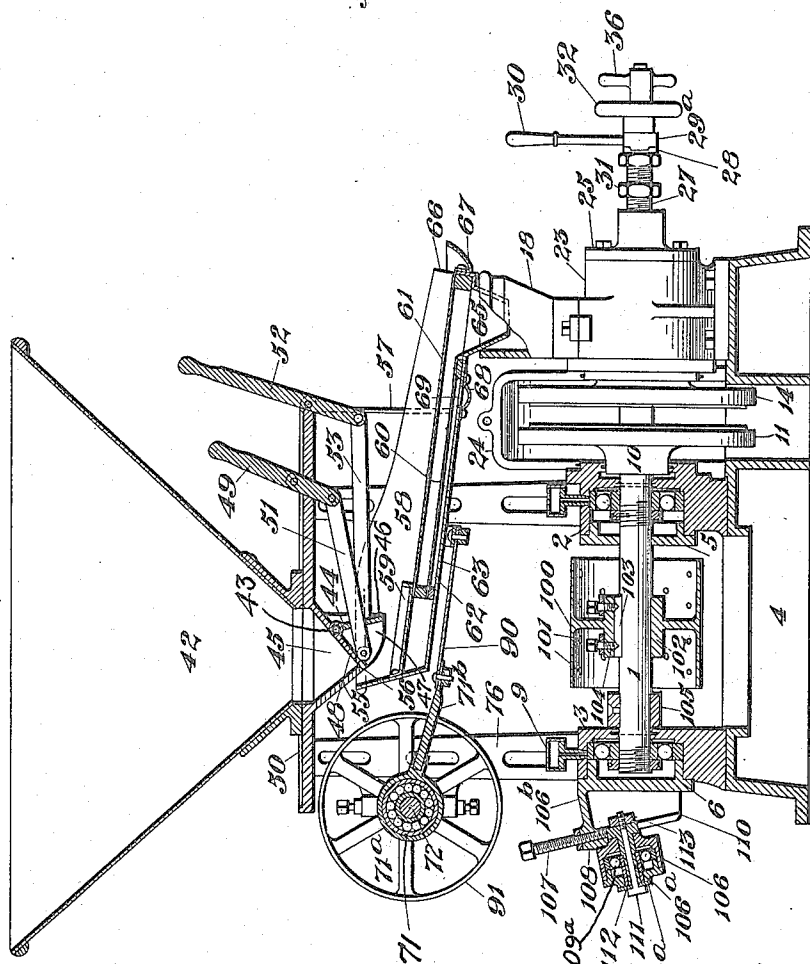


Fig. 4

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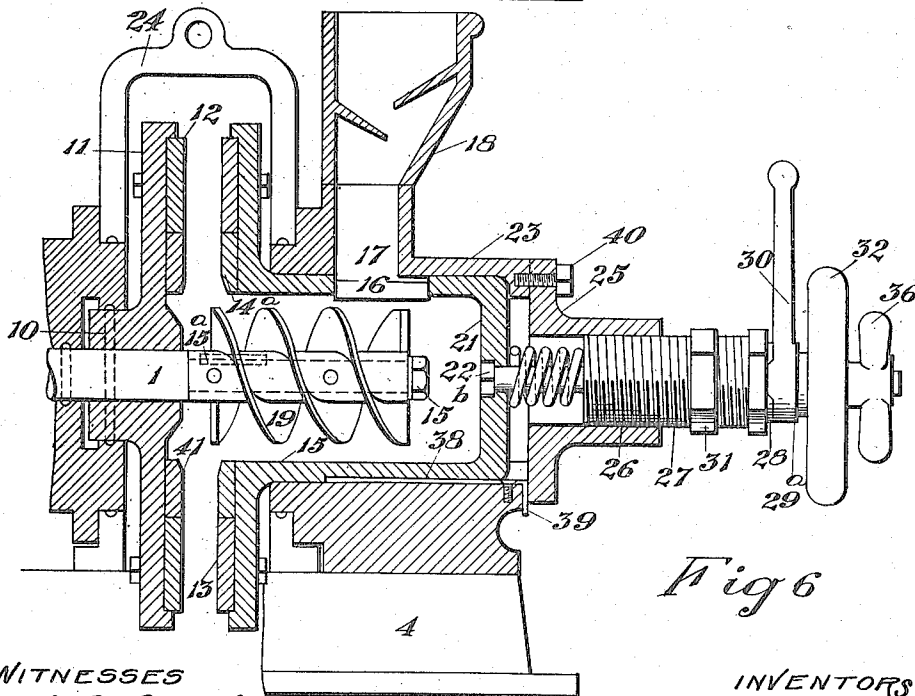
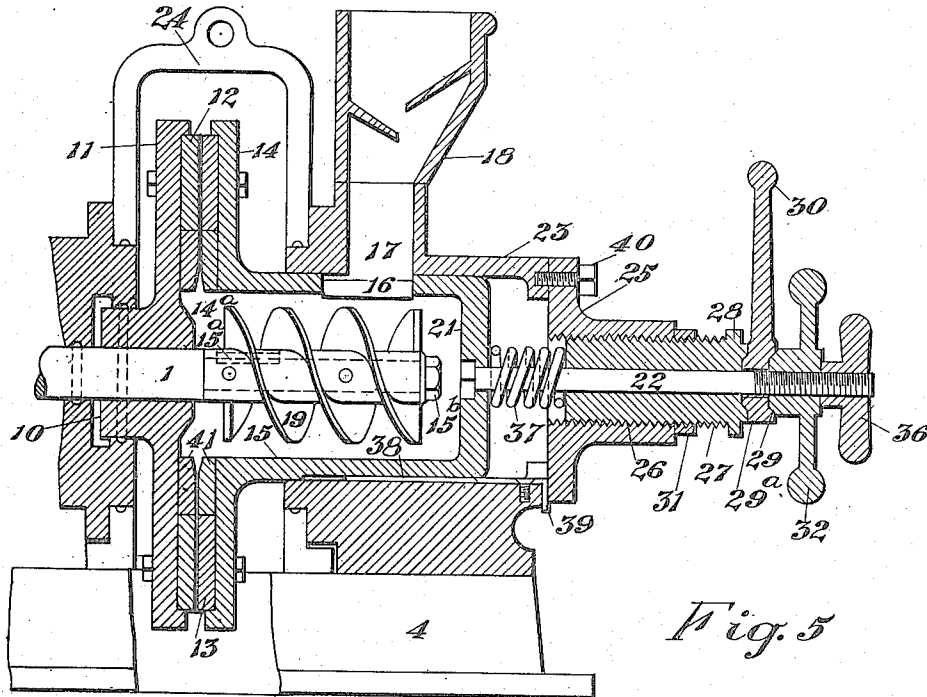
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UNITED STATES PATENT OFFICE.

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GRAIN-GRINDING MACHINE.

1,135,313.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that we, WILLIAM FORRESTER MOORE and GEORGE JAMES MOORE, British subjects, and residents of the city of Toronto, in the county of York and Province of Ontario, Dominion of Canada, have invented certain new and useful Improvements in Grain-Grinding Machines; and we hereby declare that the following is a full, clear, and exact description of the same.

This invention relates to a grain grinding machine comprising an adjustable non-rotatable grinding head acting in conjunction with a rotatable grinding head mounted upon a revoluble shaft driven by suitable means, the adjustable non-rotatable grinding head being accurately adjusted to the rotatable grinding head and held in contact with the latter by spring tensioned means automatically yielding to a limited extent to permit of the separation of the grinding heads, suitable feeding means, provided with adjustable gates, being employed to deliver the grain on an agitating shoe having screens to separate the grain from foreign substances, which are carried away by properly positioned outlets.

For an understanding of the invention reference is to be had to the following description, and to the accompanying drawings in which:—

Figure 1, is a side elevation of the machine. Fig. 2, is an end elevation of the same. Fig. 3, is an elevation of the opposite end to that shown in Fig. 2. Fig. 4, is a broken longitudinal section through the grinding machine. Fig. 5, is a sectional view through the grinding mechanism showing the normal position of the non-rotatable grinding head and adjusting means. Fig. 6, is a similar view to Fig. 5, showing the non-rotatable grinding head moved from its normal position with relation to the rotatable grinding head, by its adjusting mechanism for the purpose of repairs.

Like characters of reference refer to like parts throughout the specification and drawings.

The grinding shaft 1 is journaled in ball bearings 2 and 3 mounted on the frame base 4 of the machine, the bearings 2 and 3 being provided with caps 5 and 6 forming a cas-

ing for the balls and their races, and held in place on the shaft 1, the bearings 2 and 3 being lubricated from compression cups 9.

Fixedly mounted on the grinding shaft 1 is the hub 10 of the rotatable grinding head 11, the grinding face of the grinding head 11 being provided with grinding plates 12 to which are opposed the grinding plates 13 secured to the grinding face of the non-rotatable grinding head 14. The grinding head 14 is formed with a central bore 14^a and is provided with a hollow cylindrical shaped throat 15 projecting concentrically from its outer side face, the throat 15 being provided with an opening 16 which registers normally with the opening 17 at the bottom of the receiving hopper 18 to admit the grain to the double spiral conveyer 19. The grinding shaft 1 projects beyond the grinding head 11 and extends through the bore 14^a into the hollow throat 15, and the spiral conveyer 19, being mounted on the grinding shaft within said throat and is held in place preferably by a spline 15^a and nut 15^b construction as shown in Figs. 5 and 6. Inclosing the grinding heads 11 and 14 is a casing consisting of two removable parts 24 so that access may be conveniently had to the grinding heads. Inclosing the throat is a casing 23, and fastened to the casing 23 adjacent to the end 21 of the throat 15 is a cap 25 formed with a screw threaded bore 26, and contained in the screw threaded bore 26 is a hollow tension screw 27 formed at its outer end with a clutch member 28 to engage with the hub 29^a of the quick releasing lever 30, by which the tension of the spring 37 can be adjusted.

As shown in Figs. 5 and 6 the casing consisting of two removable parts 24 is supported on the casing 23, so that they can be separated without disturbing it or the hopper 18. Thus it is possible to readily obtain access to the grinding heads 11 and 14 which is at all times necessary for the repair of the same, and for the convenient removal of refractory substances therefrom. The cap 25 is fastened to the end of the casing 23 by removable bolts 40, so that it can be conveniently removed for access to the interior of the casing 23 without disturbing it, or the related parts of the apparatus.

Mounted on the tension screw 27 is a lock nut 31 engaging the cap 25 for the purpose of securely holding the tension screw in its fixed position and preventing its adjustment being altered by the vibration of the machine. Secured to the end 21 of the throat 15 is one end of the adjusting bolt 22. The adjusting bolt 22 extends centrally through the hollow tension screw 27, and beyond the lever 30, and is screw threaded to receive the adjusting hand wheel 32 by which it can be turned for the purpose hereinafter stated. The inner end of the hand wheel 32 is beveled to engage the adjacent and correspondingly countersunk face 29 of the quick releasing lever 30.

The quick releasing lever 30 is loosely mounted on the adjusting bolt 22 between the adjusting hand wheel 32 and the clutch member 28 of the tension screw 27, the hub 29^a of the quick releasing lever 30 engaging with the adjacent faces of the clutch member 28, and the adjusting hand wheel 32. Fitted on the adjusting bolt and engaging the outer face of the adjusting hand wheel 32 is a lock nut 36 which locks the hand wheel in its adjusted position.

Coiled upon the adjusting bolt 22 between the tension screw 27 and the end 21 of the throat 15 is a tension spring 37 to press the non-rotatable grinding head 14 into operative relation with the grinding head 11.

Formed in the throat 15 is an elongated key way 38 to receive the L-shaped key 39 which permits the throat 15 to move lengthwise, but prevents the rotation of the throat 15 and grinding head 14 so that the opening 16 of the throat 15 will continuously register with the opening 17 at the bottom of the receiving hopper 18 for a continuous flow of the grain to the spiral conveyer 19. By disengaging the bolts 40 and removing the cap 25, the key 39 can be drawn out of engagement with the key way 38 of the throat 15 thereby permitting of the revolution of the non-rotatable head 14 when changing or fixing the grinding plates 12 and 13.

The spiral conveyer 19 carries the grain to the distributing plates 41 by which it is fed to the grinding plates 12 and 13.

The tension spring 37 bearing against the end 21 of the throat 15, presses the grinding head 14 in the direction of the grinding head 11, so that the grinding plates 12 and 13 will crush the grain fed to them by the spiral conveyer 19 and distributing plates 41, the pressure of the tension spring being sufficient to resist the outward pressure of the grain, but yielding to more refractory substances and permitting the grinding head 14 to recede from the grinding head 11, so that the refractory substances can pass from between the grinding plates without materially injuring them. Should the refractory substances be not ejected by the grind-

ing plates 12 and 13 the quick releasing lever 30 can be turned in either direction causing its clutch member to disengage and force the adjusting hand wheel 32 outward drawing with it the adjusting bolt 22, throat 15, grinding head 14, and grinding plates 13, to a position which will allow the refractory substances to be ejected by the grinding plates 12 of the rotatable grinding head.

By means of the quick releasing lever 30 the separation and restoration of the grinding head 14 from and to the grinding head 11 is so rapid that no material quantity of grain escapes from between the grinding plates. To effect the separation of the grinding heads for the purpose of repairing or interchanging the grinding plates it is only necessary to slacken the lock nut 36 and turn the quick releasing lever 30, in a direction which will work the screw 27 out of the cap 25, the clutch 28 then enabling the quick releasing lever to turn the tension screw 27 to move the non-rotatable grinding head away from the rotatable grinding head without altering the tension of the spring 37, or the adjustment of the grinding plates 12 to the grinding plates 13 when the tension screw is restored to its former position. To effect the fine adjustment of the grinding plates 12 to the grinding plates 13 while the machine is running, the lock nut 36 is slackened and the adjusting hand wheel 32 is then turned until the required adjustment is effected.

Supported above the grinding heads is a table or plate 50 provided with legs or standards 76 secured to the base 4. Mounted on the table 50 is a hopper 42, and hinged on the rod 43 passing through the vertical sides 44 of a receiving box 45, below the hopper 42, is a gate 46 constructed with a centrally located pocket 47. Hinged within the pocket 47 is a second gate 48 operated by a lever 49 fulcrumed to the table 50, said lever being connected to the gate 48 by the link 51. Fulcrumed to the table 50 is a lever 52 connected to the gate 46 by the forked link 53. The gates 46 and 48 when closed form with the inclined end 55, and vertical sides 44, of the receiving box 45, a substantially V-shape trough or chamber.

The flow of the grain is regulated by the opening of one or both of said gates, or cut off by closing both gates, the opening and closing of the gates being effected by the levers 49 and 52 and their connecting links, the gates 46 and 48 underlapping the bottom edge 56 of the inclined end 55 of the receiving box 45 when the gates are in their closed position. When a rapid feed of the grain is required from the hopper 42 to the inclined agitating shoe 58, the gates 46 and 48 are moved away from the inclined end 55 of the receiving box 45, to provide a relatively large opening, through which the grain can

pass. If however a slow feed of the grain is required, or if the grain contains straw, cobs or other dirt, the gate 46 is maintained in close relation with the inclined end 55, and the gate 48 is moved to an open position within the pocket 47, the grain then being caused to pass from the hopper 42 through the pocket 47 to the agitating shoe 58. During its passage through the pocket 47 the pocket sides limit the width of the flow of grain, to the shoe, and thus prevent it "scattering."

Hung from the table 50 by flat springs 57 is the inclined agitating shoe 58 one end of which is directly below the receiving box 45, the springs permitting of a reciprocating and vibrating movement of the shoe. The shoe comprises a distributing pan 59 secured to the sides of the shoe, and screens 60 and 61 suitably supported one above the other with a space 62 between the lower screen 60 and the bottom 63 of the shoe. At the bottom 63 of the shoe, and leading into the hopper 18 is a delivery spout 65. Fastened to the end 66 of the shoe is the outlet 67 for receiving the eliminated substances from the screen 60, and fastened to the bottom of the shoe is an outlet 68 for receiving fine substances sifted from the screen 61, the said fine substances being agitated along the bottom of the shoe to an elongated opening 69 leading to the outlet 68. The opening of the gate or gates permits the grain to descend to the distributing pan 59 from which it is agitated to the screen 60 perforated with circular openings of a size sufficient to allow the grain, but no larger substances, to pass through on to the fine screen 61 which permits substances smaller than the grain to pass to the bottom of the shoe, the grain then being agitated to the receiving spout and then downward into the hopper 18.

The agitating movement of the shoe 58 is effected by an eccentric 71 on an eccentric shaft 72, an eccentric strap 71^a encircling the eccentric, and an eccentric spring rod 71^b connecting the eccentric strap with the shoe, the shaft having suitable bearings 73 and 74 respectively at either end supported by brackets 75 which are cast to the supporting legs 76.

Mounted on the shaft 72 are pulleys 91 and 92, the pulley 92 being fast and the pulley 91 being loose on the shaft.

Fastened on the shaft 1 is a driving pulley 100 perforated with holes 101 to allow the air to escape from beneath the pulley belting, and thus increase the friction of the belting on the pulley 100 and insure a better drive. The hub 102 of the pulley 100 is securely fastened to the shaft 1 by a spline 103 and set screws 104 engaging the spline.

Mounted on the shaft 1 is the pulley 105 around which a belt travels to the pulleys 91 and 92 and downward to the pulley 106,

this pulley 106 being mounted on a hollow stud 106^a vertically adjustable in a bracket 106^b extending from the cap 6, of the bearing 3, the stud 106^a projecting beyond the pulley 106. The adjustment of this pulley 106 is effected by a set screw 107 contained in a screw threaded boss 108 located on the upper part of the bracket 106^b, the bottom of the set screw 107 engaging with the stud 106^a which is vertically movable in the slide way 110. A bolt 111 passes centrally through the bore of the stud 106^a and has on its threaded end a nut 113 engaging the inner face of the slide way 110.

Suitable ball bearings 109^a are mounted upon the stud 106^a and are held in position by a spacing bushing 112, pressed inward by the washer 111^a and head of the bolt 111 during the tightening of the nut 113, the washer 111^a engaging the adjacent end of the stud 106^a to limit the movement of the bolt head and provide for the free revolution of the pulley. The adjustment of the pulley in the slide way 110 is effected by the set screw 107 after the nut 113 has been disengaged from the inner face of the slide 109.

Having now particularly described the nature of our said invention and in what manner same is to be performed, we declare that what we claim is:—

1. A grain grinding machine comprising, a non-rotatable grinding head having an elongated hollow hub with a grain receiving opening in it, a rotatable grinding head opposed to the non-rotatable grinding head, a shaft for the rotatable grinding head projecting into the elongated hollow hub of the non-rotatable grinding head, a spiral conveyor on the shaft within the elongated hollow hub, a casing inclosing the elongated hollow hub having a grain receiving opening registering with the opening in the elongated hollow hub, a hopper mounted on said casing and registering with said openings, a removable key within the said casing to prevent the revolution of said elongated hollow hub and non-rotatable grinding head, and a removable cap for the end of said casing whereby access may be had to said key without disturbing the fixed relation of the other parts.

2. A grain grinding machine comprising, a non-rotatable grinding head having an elongated hollow hub, a rotatable grinding head, a removable key to prevent the rotation of the non-rotatable grinding head, a removable cap for the end of said casing whereby convenient access can be had to said key, a hollow tension screw adjustable through said cap and unitedly movable with it, an adjusting bolt connected with the elongated hollow hub and extending through the adjusting screw, a tension spring bearing against the elongated hollow hub and tension screw, and means for caus-

ing the united movement of the tension screw and adjusting bolt independently of non-rotatable grinding head removable with 10 the cap.

Toronto, October 11th, 1913.

3. A grain grinding machine comprising
5 a rotatable grinding head, a non-rotatable grinding head opposed to the rotatable grinding head, a casing inclosing the grinding heads, a removable cap for the end of said casing, and means for adjusting the

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."