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PATENTED SEPT. 24, 1907.

S. K. DENNIS & F. W. RICE.

FEED GRINDER.

APPLICATION FILED FEB. 6, 1907.

2 SHEETS—SHEET 1.

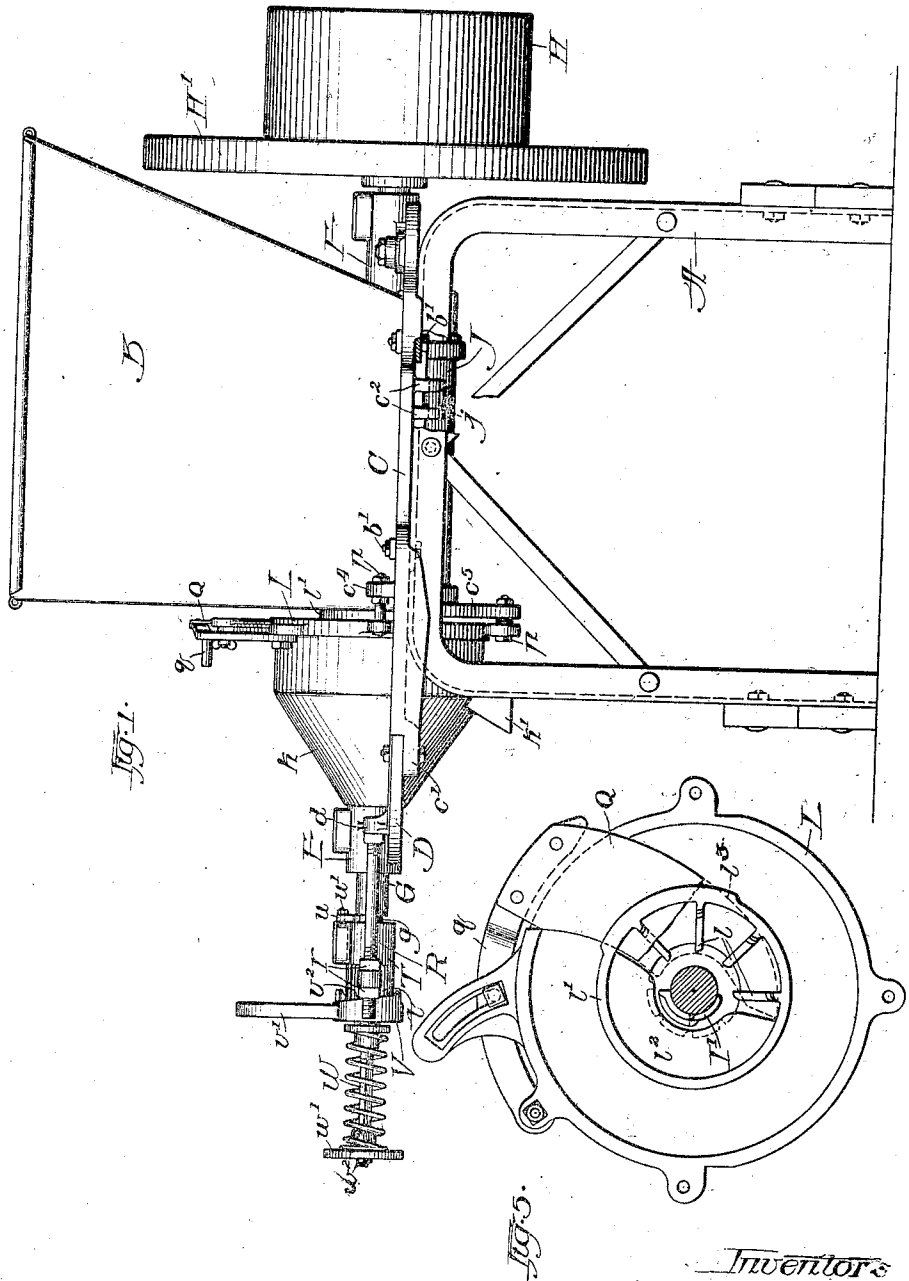

Fig. 1.

Fig. 5.

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2 SHEETS—SHEET 2.

Fig. 3.

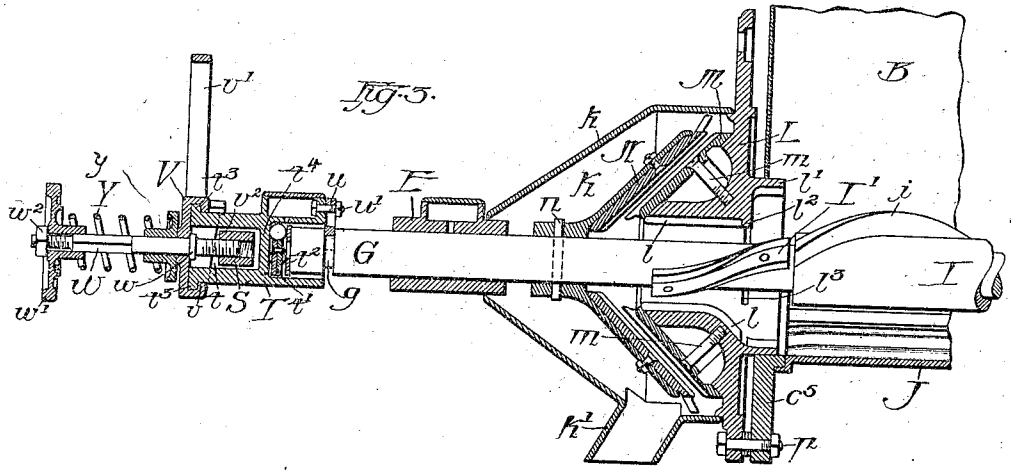


Fig. 2.

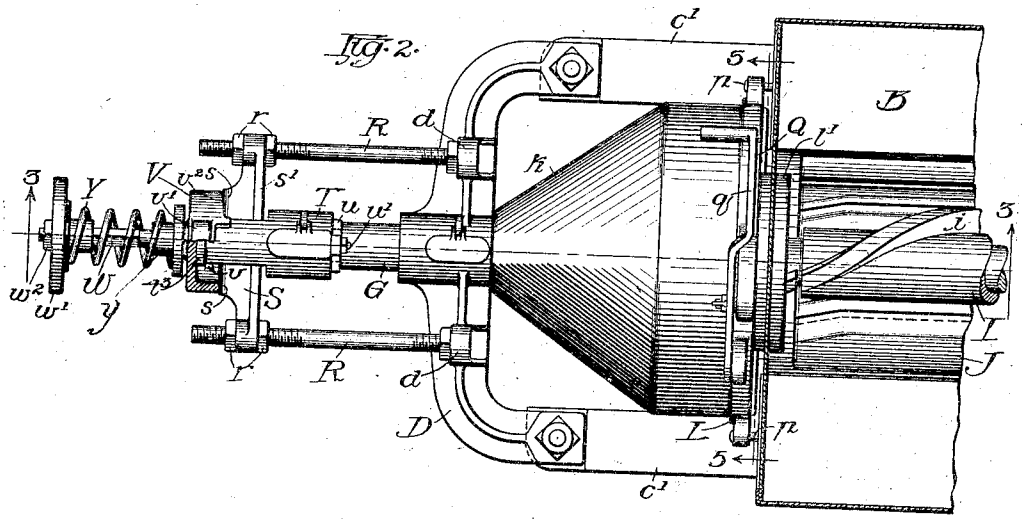
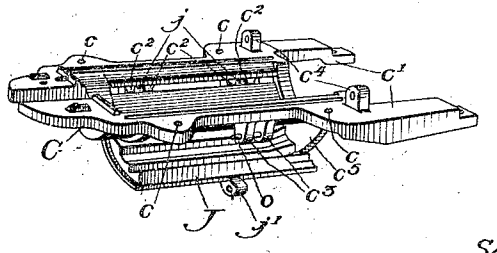


Fig. 4.



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UNITED STATES PATENT OFFICE.

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FEED-GRINDER.

No. 867,018. Specification of Letters Patent. Patented Sept. 24, 1907.

Application filed February 6, 1907. Serial No. 355,990.

To all whom it may concern:

Be it known that we, SAMUEL K. DENNIS and FRANK W. RICE, citizens of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Feed-Grinders, of which the following is a complete specification.

This invention relates to feed grinders, and more particularly to those of the cone and shell type.

The object of the invention is to secure a more efficient feeding and initial breaking device; also feed regulating means, an emergency mechanism for separating the grinding cones in the event any destructive foreign substance is engaged thereby, and to effect further improvements in the details of construction of feed grinders.

Referring to the accompanying drawings—Figure 1 represents a side elevation of a complete feed grinder embodying our improvements. Fig. 2 is a plan of the left-hand or grinding end of the machine. Fig. 3 shows a central longitudinal section of the parts disclosed in Fig. 2, the view being taken on the line 3—3 of said figure. Fig. 4 is a perspective of the hopper bottom from the rear side as viewed in Fig. 1, showing the hinged concave in connection therewith; and Fig. 5 represents an inside elevation of the fixed cone support and feed slide in connection therewith, the view being taken as indicated by the line 5—5 in Fig. 3.

In the drawings the supporting frame is designated by the letter A, the hopper which is mounted thereon by B, and the hopper base by C. The hopper is secured to its base by means of the bolts b^1, which engage said hopper and are received by the bolt holes c in the hopper base, and also in corresponding bolt holes in the frame A.

The hopper base C is provided with the outwardly projecting shaft-bearing bracket arms c^1, to which is fixed the shaft-bearing bracket D, carrying the shaft-bearing E. On the opposite end of the hopper base C is fixed the other shaft-bearing F, and in these bearings E and F journals the shaft G, to the end of which is secured the driving pulley H and balance wheel H^1. On this shaft, within the hopper B, is fixed the cob-breaker and feed screw I, formed of a sleeve and the spirally disposed rib i thereon.

To the base C of the hopper, and forming the bottom thereof, is hinged the concave J, which coöperates with the said cob-breaker and feed screw. This concave is provided with the two lugs j on one side (only one appearing in Fig. 1), which have a permanent hinge connection with the corresponding lugs c^2 on the hopper base C. The other side of the concave is breakably fastened to the hopper base by means of the wooden pin o, or the equivalent thereof, which engages the lugs c^3 on the under side of the base C and the lug j^1 on the corresponding side of the concave J.

Located adjacent to the lower side of the hopper B is the conical shaped grinding chamber K, inclosed by the wall k, through which the shaft G extends and from which leads the discharge spout k^1. A fixed cone support L lies intermediate of the chamber K and hopper B, forming the wall therebetween, said support being secured to the hopper base C by means of the bolts b, which pass therethrough and engage corresponding apertures in the lugs c^4 and in the depending flange c^5. The object in having the concave J breakably supported, as above described, is to permit it to immediately drop to an inoperative position through the shearing of the wooden pin whenever a stone, a piece of iron or other foreign substance is inadvertently thrown into the hopper and is engaged by the feed screw and said concave. If the concave was fixed rigidly instead of being breakably supported, either it or the feed screw, or some other part of the grinder would be obliged to yield and be broken by any hard substance which might be introduced with the material operated upon. The wooden pin is sufficiently strong to withstand the stress due to normal operation, but any unusual stress will cause it to shear before any of the parts break.

The fixed cone support L is formed with a central bore, which is preferably provided on its interior with the longitudinally extending ribs l (see Figs. 3 and 5), and terminating at its inner face in an enlarged opening surrounded by the flange l^1. To this fixed cone support L is secured, by means of the screws m, the fixed cone M, and to the shaft G is fixed, by the pin n, the coöperating movable cone N, both the fixed and movable cones being located in the grinding chamber K. Fixed to the shaft G, within the bore of the cone support L and designed to coact with the ribs l therein, is a spirally disposed auxiliary feed screw I^1, said screw being arranged to form in effect a continuation of the spiral rib i of the feed screw I.

To regulate the feed of the material from the hopper to the cones in the grinding chamber K, a flange l^2 is made to extend over substantially half the bore of the support L, the flange being recessed in the middle, as clearly shown in Fig. 5, to provide space for the rotation of the shaft G and the auxiliary feed screw I^1 thereon. A movable slide Q is arranged to coöperate with this flange l^2 and regulate the extent of the opening in the other half of the bore, the slide being adjusted by means of the hand lever q, and is made to work through the slot l^3 in the cone support L.

As usual in grinders of the type herein represented, means are provided for effecting the adjustment of the movable cone with respect to the fixed cone.

Such means are constructed as follows: Projecting outwardly from the lugs *d* on the shaft-bearing bracket D are the rods R, threaded at their outer ends also, and taking the nuts *r*, between which is thus adjustably held the thrust box support S. This box support S is provided with the cam engaging edges *s* on its outer face and the ribs s^1 on its upper face, the central part of the ribs being removed in order to provide a way on which slides the longitudinally movable thrust box T. The outer end of this box has cut therein the slot *t*, which straddles the support S and shoulders against the ends of the ribs s^1. The inner end of the box has formed therein a bore which engages the outer end of the shaft G, the end thrust of said shaft being taken up by the cage and balls t^1, the steel washer t^2 affording the bearing surface for the shaft. To permit the shaft G to rotate in the thrust box T, and to also compel it to move therewith in the longitudinal adjustment of the said box, an annular groove *g* is cut in the shaft adjacent to the inner end of the box, and an inwardly projecting arm *u* is fixed to the box T by means of the bolt u^1, the end of this arm engaging the said groove *g*. From the foregoing it will be seen that longitudinal adjustment of the thrust box T will produce a corresponding longitudinal movement of the shaft G and cone N.

The outer end of the slotted portion of the box T is provided at the top and bottom with the flanges t^3, whichare engaged by the cam lever V. The body portion of the cam lever is of circular outline, recessed as shown, to receive the flanged end of the box T, the flange *v* of the cam being cut away on both sides for a distance equal to the length of the flanges t^3 on the box, so that when the handle v^1 of the cam lever V extends horizontally the cutaway portions of the flange *v* will register with the flanges t^3 on the end of the box T, permitting the said cam to be placed in position, and when the lever is turned to normal position the two parts will be locked together, the said cam lever forming in effect a cap for the said box. The inner face of the cam lever V is provided with the cam surface v^2, which coöperates with the relatively fixed cam engaging edges *s* on the box support S, so that movement of the lever handle v^1 to the left (to the left when facing the grinding chamber side of the machine) will cause the thrust box T, shaft G and cone N to be moved outwardly. Threaded in that portion of the thrust box support S which lies within the slotted portion of the thrust box T, and projecting outwardly therefrom, through an aperture in the body of the cam lever V, is the adjustment screw W. A shoulder *w* is formed on this screw, against which the thrust box, through the cam lever V, is made to bear, and the outer end of said screw is squared, as shown, and receives the adjustment wheel w^1, the nut w^2 holding said wheel in position. Between the adjustment wheel w^1 and the thrust box T a coil expansion spring Y is interposed, a washer *y* being placed between the end of the spring and said box. This spring Y holds the cam V against the shoulder *w* during the operation of the machine, and hence its strength must be greater than the end thrust on the shaft G arising from pressure between the grinding cones N and M when in operation. With the adjustment screw W the cone N may be adjusted with respect to its coöperating cone to grind to any degree of fineness, the shoulder *w* forming an adjustable inner stop to limit the inward movement of the thrust box T as well as the shaft and cone N. The portion t^4 in the box T constitutes an adjustable outer stop which limits the outward movement of the cam members. The shoulder *w* on the adjustment screw, by limiting the inward movement of the cone N, thereby prevents actual contact between the grinding cones when the mill is running empty, and hence prevents mutual injury of the grinding surfaces. In the event a stone or other hard foreign substance is inadvertently admitted to the grinding cones, the handle v^1 of the cam lever V is immediately thrown to move the cone N away from the cone M before the grinding surfaces can be materially injured. As soon as the foreign substance is removed the cam lever is returned to normal position, and it is to be noted that in the operation of this emergency cam lever V to move the cone N out and in the accurate adjustment of the working relation of the two cones is not disturbed.

In operation if a wet cob or the like is engaged by the grinding cones, the movable cone N and shaft G will be forced outwardly against the pressure of the spring Y until the box partition t^4 strikes against the box support S. This support S is rendered longitudinally adjustable by means of the nuts *r* on the rod R. There is thus provided a longitudinally adjustable stop to limit both the outward and inward movement of the thrust box T and the shaft and movable cone N in operative connection therewith.

What we claim as our invention, and desire to secure by Letters Patent, is:

1. In a feed grinder, in combination, a feed hopper, a grinding chamber, a longitudinally adjustable shaft extending through said hopper and grinding chamber, a cone fixed in the grinding chamber, a coöperating cone fixed to the shaft, a thrust box support, means for securing the same to the grinder frame, a longitudinally sliding thrust box adjustably mounted on said support and engaging the end of said shaft, a cam lever rotatively engaging the end of the sliding thrust box and adapted to bear with its cam surface against the said thrust box support, a shouldered adjustment screw projecting outwardly from the thrust box support, the shoulder thereof being arranged to engage and bear against the sliding box through the said cam lever, and a spring reacting between the end of said adjustment screw and the cam lever, thereby tending normally to hold the two cones in operative relation with respect to each other.

2. In a feed grinder, in combination, a feed hopper, a grinding chamber, a longitudinally adjustable shaft extending through said hopper and grinding chamber, a cone fixed in the grinding chamber, a coöperating cone fixed to the shaft, a longitudinally adjustable sliding thrust box engaging the outer end of the shaft, a thrust box support passing transversely through said box, the support constituting an adjustable stop to limit the outward movement of the sliding box, threaded rods for adjustably securing said support to the grinder frame, an adjustment screw projecting outwardly from said box support, a shoulder on said screw with which the box engages, said shoulder forming a stop to limit the inward movement of the sliding box, and a spring reacting between the outer end of the adjustment screw and said box.

3. In a feed grinder, in combination, a hopper, a grinding chamber located adjacent thereto, a shaft extending through said hopper and grinding chamber, a cob breaker and feed screw fixed thereto, said screw consisting of a sleeve having a spirally disposed rib formed thereon, a fixed cone support located between the hopper and chamber, said support having a central bore which terminates at its inner face in an enlarged flanged opening and

which is provided on its interior with longitudinally extending ribs, a fixed cone secured to said support, a movable cone secured to said shaft, and coöperating with said fixed cone, and a spirally disposed auxiliary feed screw fixed to said shaft and arranged to coact with the ribs on the interior of the fixed cone support, said auxiliary feed screw being constructed and secured to the shaft independently of the said cob breaker and feed screw.

4. In a feed grinder, in combination, a hopper, a grinding chamber located adjacent thereto, a shaft extending through said hopper and grinding chamber, a fixed cone support located between the hopper and chamber and forming the wall therebetween, the said support having a central bore provided on its interior with longitudinally extending ribs and terminating on its inner face in an enlarged flanged opening, the flanged opening having formed therein a transversely extending slot, a fixed cone secured to said support, a movable cone secured to said shaft and coöperating with said fixed cone, a cob breaker and feed screw secured to said shaft and placed in the bottom of the hopper, a spirally disposed auxiliary feed screw constructed and fixed to said shaft independent of said cob breaker and feed screw and arranged to coact with the ribs on the interior of the fixed cone support, an inwardly projecting flange formed in the mouth of the enlarged flanged opening of the central bore of said support, said flange covering substantially one-half of the mouth of said opening, and a movable slide adapted to fit in the transversely extending slot formed in the flange of said opening, said flange and slide operating to close the passageway between the hopper and grinding chamber.

5. In a feed grinder, in combination, a feed hopper, a grinding chamber, a longitudinally adjustable shaft extending through said hopper and grinding chamber, a cone fixed in the grinding chamber, a coöperating movable cone fixed to the shaft, adjusting means normally stationary for affecting the longitudinal adjustment of said shaft and cone, the shaft and cone being longitudinally movable in a direction to separate the two cones independently of said adjusting means, and a rotatable device normally stationary and operative independent of the adjusting means for positively sliding the shaft and cone thereon endwise, thereby separating the two cones without disturbing the adjustment of said adjusting means.

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