(No Model.) 3 Sheets—Sheet 1.

H. CUTLER.

GRINDING MILL.

No. 348,384. Patented Aug. 31, 1886.

Fig. 1.

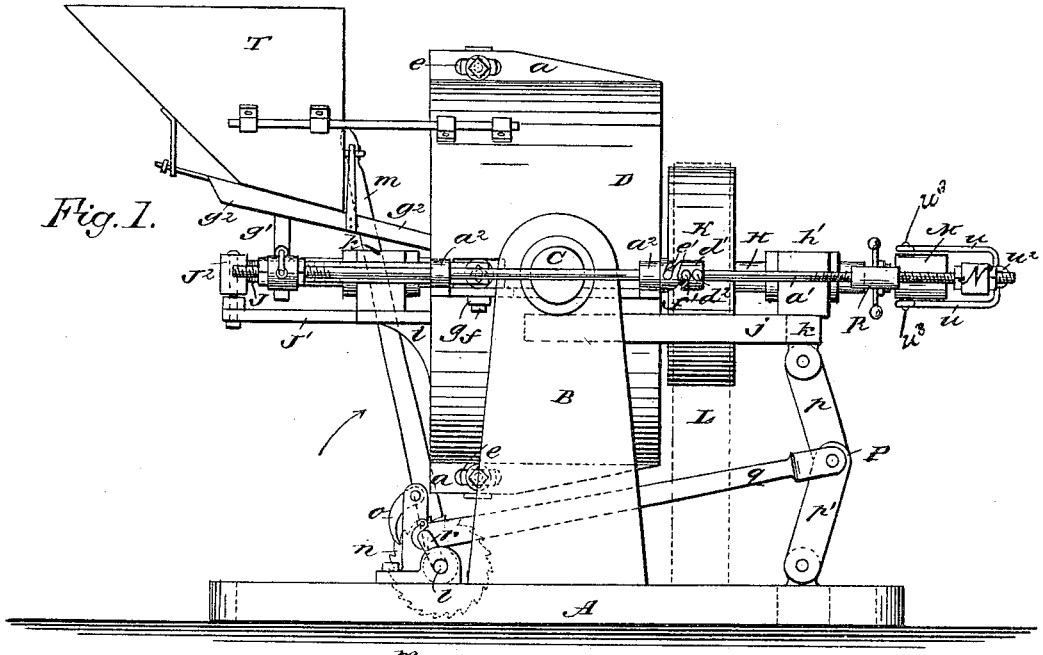

Fig. 2.

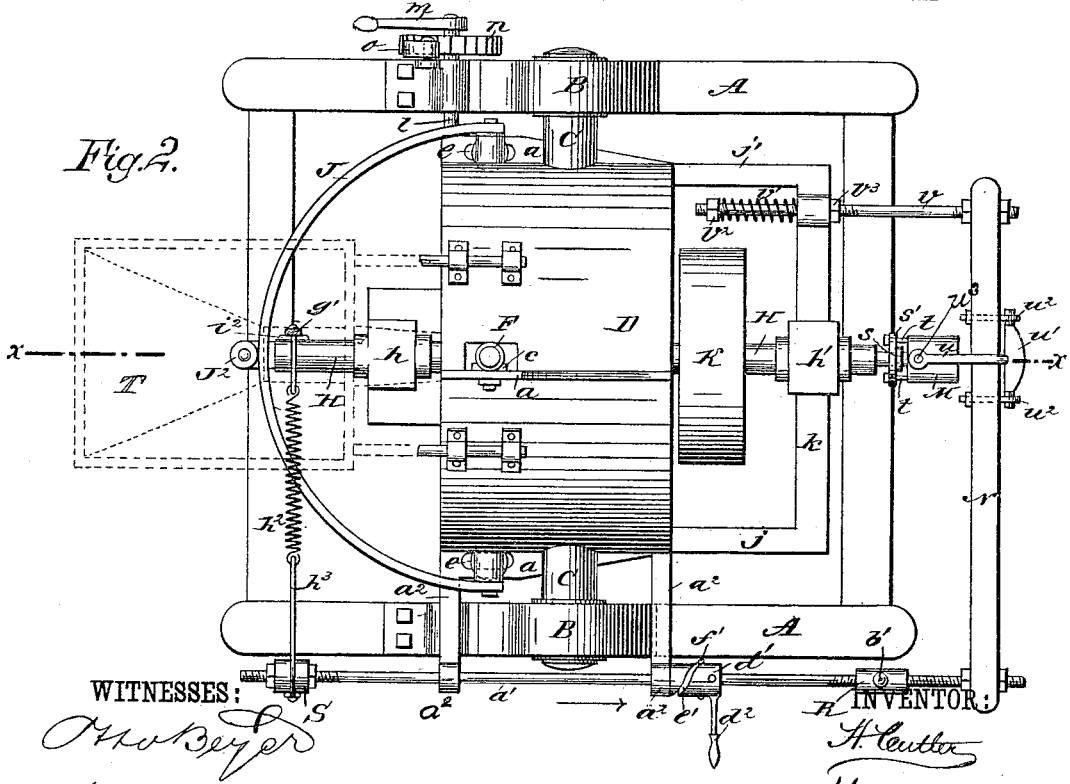

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Fig. 3.

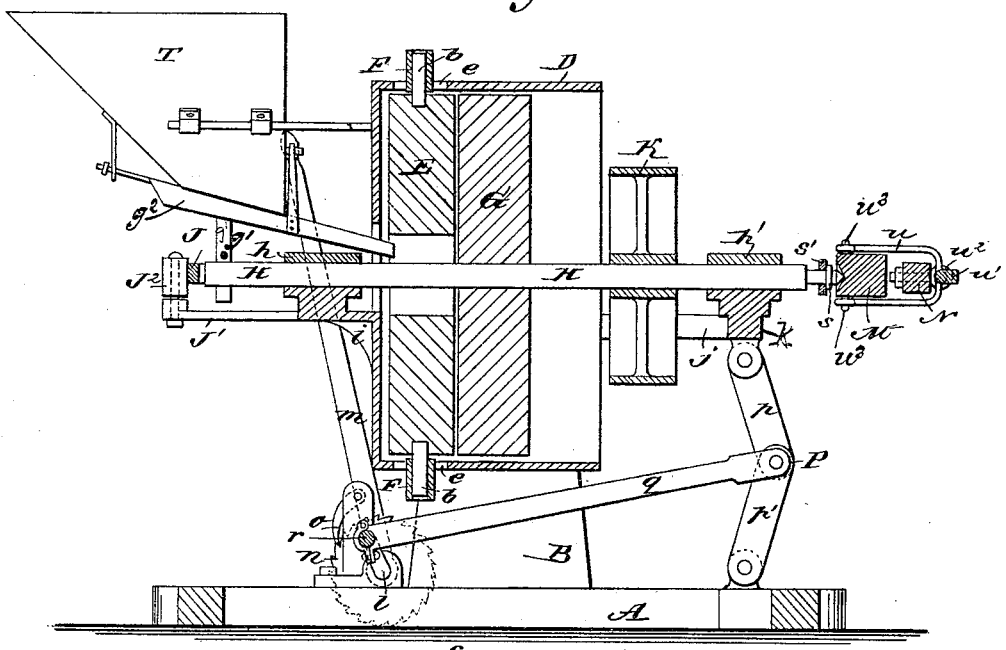

Fig. 4.

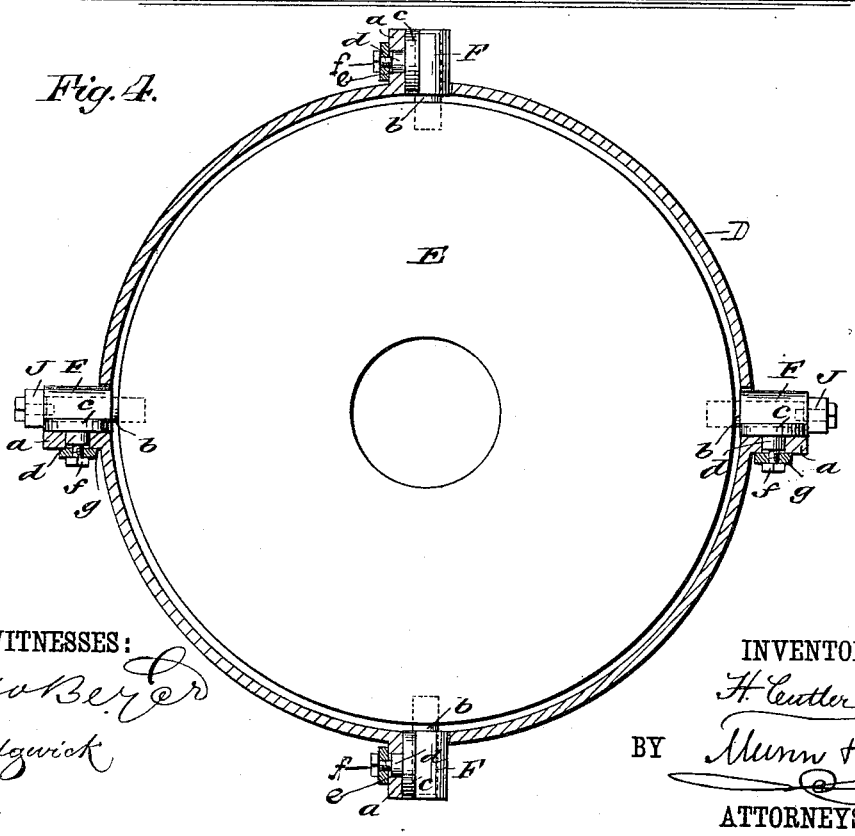

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Fig. 5.

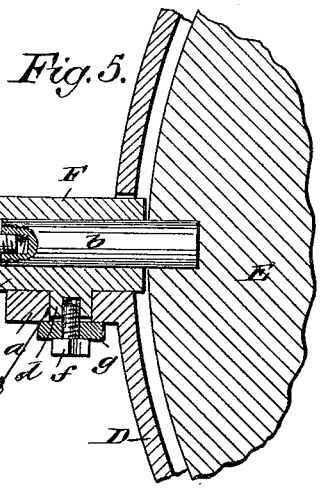


Fig. 6.

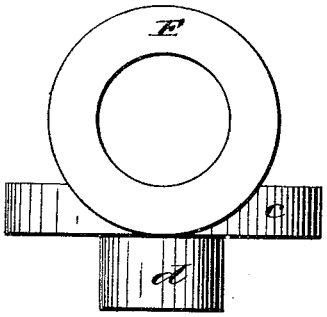


Fig. 7.

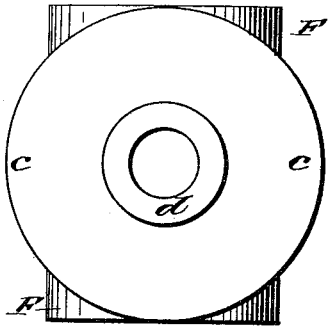


Fig. 8.

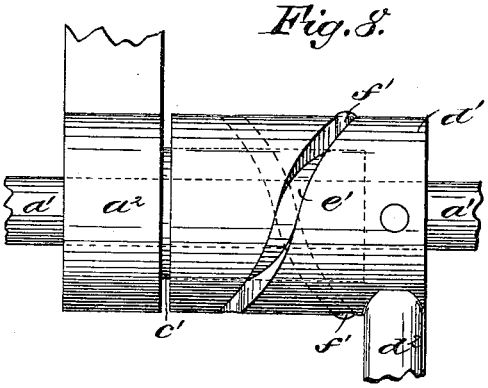


Fig. 9.

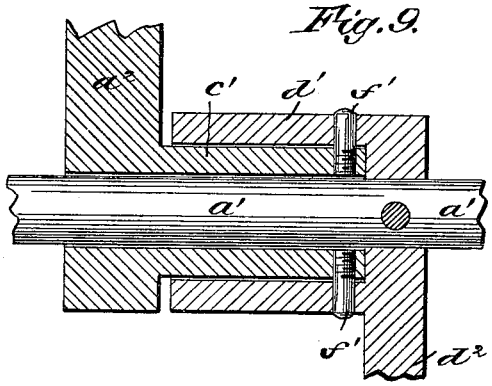
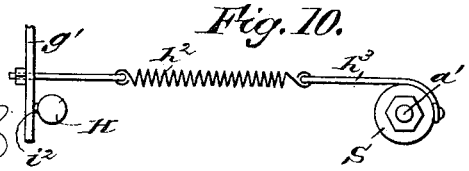


Fig. 10.



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UNITED STATES PATENT OFFICE.

HENRY CUTLER, OF NORTH WILBRAHAM, MASSACHUSETTS, ASSIGNOR TO HENRY WILLIS CUTLER, OF SAME PLACE.

GRINDING-MILL.

SPECIFICATION forming part of Letters Patent No. 348,384, dated August 31, 1886.

Application filed December 9, 1885. Serial No. 185,188. (No model.)

To all whom it may concern:

Be it known that I, HENRY CUTLER, of North Wilbraham, in the county of Hampden and State of Massachusetts, have invented a new and improved Grinding-Mill, of which the following is a full, clear, and exact description.

Vertical-disk grinding-mills are for many purposes superior to the ordinary form of horizontal-disk mills; but such vertical mills have not been generally adopted, because of the many defects in their construction. A principal defect is that heretofore these mills have not been been supplied with any suitable stopping or starting device.

The nature of my invention consists of the combinations of parts, including their construction, substantially as hereinafter set forth, and pointed out in the claims.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar letters of reference indicate corresponding parts in all the figures.

Figure 1 is a side view of my improved grinding-mill. Fig. 2 is a plan view of the same. Fig. 3 is a vertical sectional view taken on line *x x* of Fig. 2. Fig. 4 is an enlarged view of the stationary stone, the mill being shown in section. Fig. 5 is an enlarged view of a portion of the stationary stone and one of its supporting devices. Fig. 6 is an enlarged elevation of one of the trunnion-boxes, showing its base and boss. Fig. 7 is a view of the under side of the same. Fig. 8 is a sectional plan view of the spirally-grooved sleeve and attachment by which the running-stone is thrown back from the stationary stone. Fig. 9 is a sectional view of the same. Fig. 10 is a view of the agitator and its operating mechanism.

Referring now to the general construction, as best illustrated in Figs. 1 and 2, A is the base or bed of the mill, which bed is provided with two vertical standards, B B, formed with bearings in their upper ends, in which the trunnions C C of the mill-case D are mounted. This mill-case D is made in the ordinary manner to form a short cylindrical covering for the stones, and is provided with four equidistant outside flanges.

The stationary stone E, which is best seen in Figs. 3 and 4, is provided with four radial trunnions, *b b*, placed at equal distances in the periphery of the stone and extending through apertures in the case. These trunnions ride in boxes F, (see Figs. 5, 6, and 7,) each being formed with a base, *c*, and a boss, *d*, which projects from the base in a line at right angles to the general line of the box. The flanges *a a* of the case D are slotted, as shown at *e*, and in these slots the bosses *d* are fitted, the under side of each base *c* being held against the face of the flange by a tap-bolt, *f*, which is passed through a washer, *g*, and engages with a threaded socket formed in the boss *d*. In practice I prefer that two of the trunnions *b* should be in a vertical plane, while the other two are in a horizontal plane, so that when it becomes necessary to adjust the stationary stone, in order to bring it into proper alignment with the running-stone G, mounted in a manner to be hereinafter described, it is simply necessary to loosen the bolts *f* of the boxes of the trunnions in order that the stone may be left free to turn upon said trunnions; and it will be easily understood, when the stationary stone is hung in this way, that as it changes position in coming to alignment with the running-stone vertically, the trunnions *b*, that are in the horizontal plane, will turn in their boxes, while the trunnions that are in the vertical plane will slide in their boxes endwise, the boxes turning somewhat on the bosses *d*. In aligning horizontally the reverse of this takes place—that is, the vertical trunnions will turn, and the horizontal trunnions will slide, in their respective boxes. During these movements the center of the stationary stone will not be changed from the center line of the shaft the bearings of which have a rigid connection with the case. In this way a very accurate and nice adjustment of the stones may be obtained, and when the alignment is correct and the running-stone bearing fairly against the stationary stone the bolts *f* are to be tightened again.

In order that the stationary stone may be kept in place when being adjusted upon its trunnions, I provide a circular bar, J, which extends outward in front of the mill and is secured by bolts to the ends of the horizontal

trunnions. This bar J bears upon a roller, J^2, which is carried by a rigid arm, J′, that projects forward from the bracket *i* of the mill-case D, such arrangement affording a fixed point against which the stationary stone rests when being forced into alignment. The shaft H, upon which the running-stone G is mounted, rests in bearings *h h′*, the bearing *h* being carried by the bracket *i*, above referred to, which projects from the front of the mill-case D, while the bearing *h′* is carried by a bar, *k*, supported by arms *j j′*, which project from the rear of said case. The shaft H carries a fixed pulley, K, which is preferably formed with a high crown.

From the foregoing description it will be seen that the stones, mill-case, pulley, and driving-shaft are mounted so that they are free to swing in the same direction at the same time upon the trunnions C C.

In order that the frame, in which the parts named are arranged may be adjusted as the necessities of the case require, I provide such adjustable mechanism as will now be specifically described. To the bed A there is fixed a transverse crank-shaft, *l*, to one end of which there is fixed a lever-arm, *m*, and a ratchet-wheel, *n*, which is engaged by a pawl, *o*. The upper link, *p*, of a toggle-lever, P, is pivotally connected to the cross-bar *k* directly beneath the bearing *h′*, while the lower link, *p′*, is pivotally connected to the bed A, the central joint of the toggle-lever being connected to the crank *r* of the shaft *l* by means of the link *q*, so that as the crank-arm *m* is turned in the direction of the arrow shown in Fig. 1 the rear of the shaft H will be lowered, thereby slacking off the belt L and stopping the mill, while, if the lever *m* is thrown in the opposite direction, the shaft and pulley will be raised and the belt tightened, so as to drive the pulley forward and start the mill.

In order that the running-stone G may be held to its work, but at the same time be free to recede from the stationary stone should any hard substance — such as iron — accidentally pass between the surfaces of the stones, I provide such mechanism as will now be described. Upon one end of the shaft H, I form a fixed collar, *s*, back of which there is placed a loose collar, *s′*, through which pass the bolts *t t*, by which the collar is held to the horizontal step or block M, against which the end of the shaft abuts, said step being connected to a bar, N, mounted, as will be presently described, by a stirrup, *u*, which is provided with a cross-arm, *u′*, mounted in bearings u^2, carried by the bar N, the connection between the step M and the stirrup *u* being formed by means of pivot-pins, as at u^3. One end of the bar N is supported by a short rod, *v*, which passes through the bar *k*, its projecting end being provided with a spiral spring, *v′*, while the inner end of the rod is threaded to engage with the nut v^2, a second nut, v^3, being arranged upon the rod *v* on the outer side of the bar *k*. The other end of the bar N is supported by a shaft, *a′*, which is carried by projecting arms a^2, which extend from the case D. This shaft *a′* is broken at about the point *b′*, the approaching ends being threaded to engage with a double or right and left hand threaded nut, R. One of the arms a^2 is provided with a sleeve, *c′*, through which the shaft *a′* passes. A second sleeve, *d′*, formed with a spiral groove, *e′*, is pinned or keyed to the shaft *a′* in position to overlap the sleeve *c′*, which sleeve is provided with projecting pins *f′*, which ride in the groove *e′* of the sleeve *d′*.

In order that the running-stone may be yieldingly held adjusted to the stationary stone, the nut v^2 is loosened or tightened to regulate the tension of the spring *v′*. In accordance with the direction in which it is desired to adjust the running-stone when grinding, movement is imparted to the opposite end of the bar N by means of the nut R, and when it is desired to throw the running-stone back and away from the stationary stone and out of contact therewith the sleeve *d′* is thrown over by means of its handle d^2, thus moving the bar *a′* in the direction of the arrow and at the same time partially rotating the bar, which partial rotation of the bar stops the motion of the agitator *g′*, said agitator being attached to the shoe g^2, which is hung, in the usual manner, beneath the hopper T. As is best shown in Figs. 1, 2, and 10, the agitator *g′* is connected by means of a spring, h^2, and a strap, h^3, to a bobbin, S, which is carried by the shaft *a′*, so that as the shaft *a′* is turned over toward the mill-case the strap h^3 will be unwound and the agitator allowed to fall back from the shaft H, which carries a cam-face, i^2.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination, with a mill-case having slotted flanges, and a stone having the trunnions *b*, of boxes F, formed with bases *c*, and bosses *d*, washers *g*, and tap-bolts *f*, substantially as described.

2. In a vertical-disk grinding-mill, the combination, with the casing D, provided with flanges *a a*, slotted at *e e*, of a stationary stone provided with trunnions, and boxes formed with bosses which enter and are held in the slots formed in the flanges of the mill-case, substantially as described.

3. In a vertical-disk grinding-mill, the combination, with a mill-case formed with trunnions and provided with arms, brackets, and bearings, of the driving-shaft, its pulley, and adjusting devices, whereby the mill-case and its connections are tilted, substantially as described.

4. In a vertical-disk grinding-mill, the combination, with a mill-case formed with trunnions and provided with arms, brackets, and bearings, of the driving-shaft, its pulley, and adjusting devices consisting of the toggle-lever P, link *q*, crank-shaft *l*, and lever *m*, substantially as described.

5. In a vertical-disk grinding-mill, the combination, with the case D, provided with

flanges *a a*, slotted at *e e*, of the stationary stone provided with trunnions, the boxes secured to the flanges *a*, a circular bar, J, carried by the horizontal trunnions, a roller, J^2, and an arm, *J'*, substantially as described.

6. In a vertical-disk grinding-mill, the combination, with the mill-case, running and stationary stones, of the shaft H, mounted in bearings supported by the mill-case and formed with a collar, *s*, a step, M, loose collar *s'*, and bolts *t t*, substantially as described.

7. In a vertical-disk grinding-mill, the combination, with the mill-case, the stones, and shaft-supporting frame, of the shaft H, formed with collar *s*, loose collar *s'*, bolts *t t*, step M, stirrup *u*, arm *u'*, bar N, and eyes u^2, substantially in the manner described.

8. In a vertical-disk grinding-mill, the combination of the following elements, viz: mill-case D, stones E and G, shaft H, bearings *h h'*, collars *s* and *s'*, bolts *t t*, step M, stirrup *u*, arm *u'*, bar N, eyes u^2, rod *v*, spring *v'*, nuts v^2 v^3, and a shaft, *a'*, substantially as described.

9. In a vertical-disk grinding-mill, the combination, with the main driving-shaft, of the shaft *a'*, the sleeve *d'*, secured to said shaft *a'* and provided with the spiral groove *e'*, and handle d^2, the sleeve *c'*, provided with pins *f'*, projecting therefrom and entering the groove *e'*, and a suitable connection between the main driving-shaft and the shaft *a'*, substantially as set forth.

10. In a vertical-disk grinding-mill, the combination, with the mill-case, stones, the main driving-shaft, and means for supporting the same, of the two-part shaft *a'*, nut R, bar N, rod *v*, and spring *v'*, substantially as described.

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