(No Model.)

2 Sheets—Sheet 1.

G. & A. RAYMOND.

Grinding Mill

No. 237,599. Patented Feb. 8, 1881.

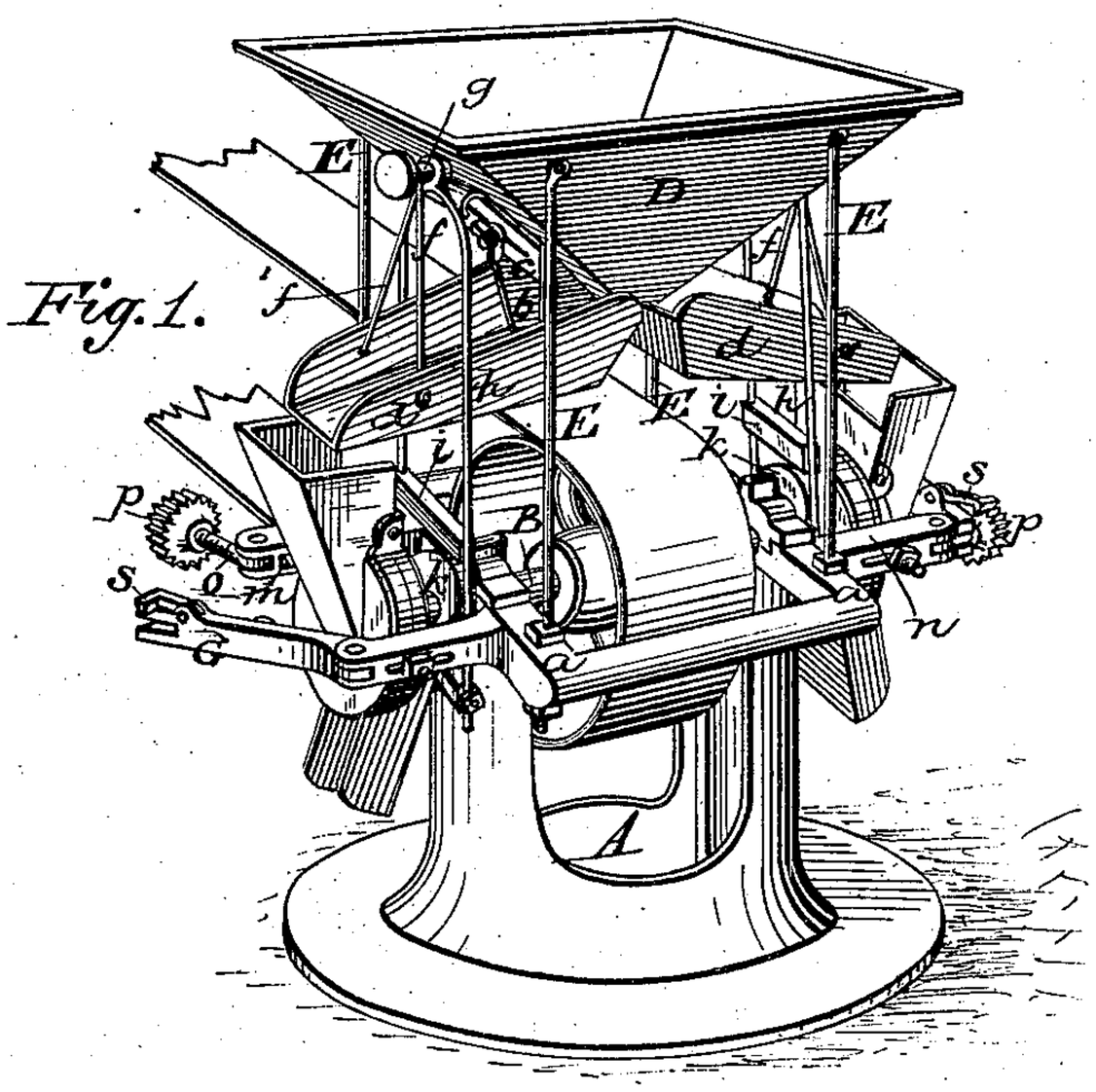
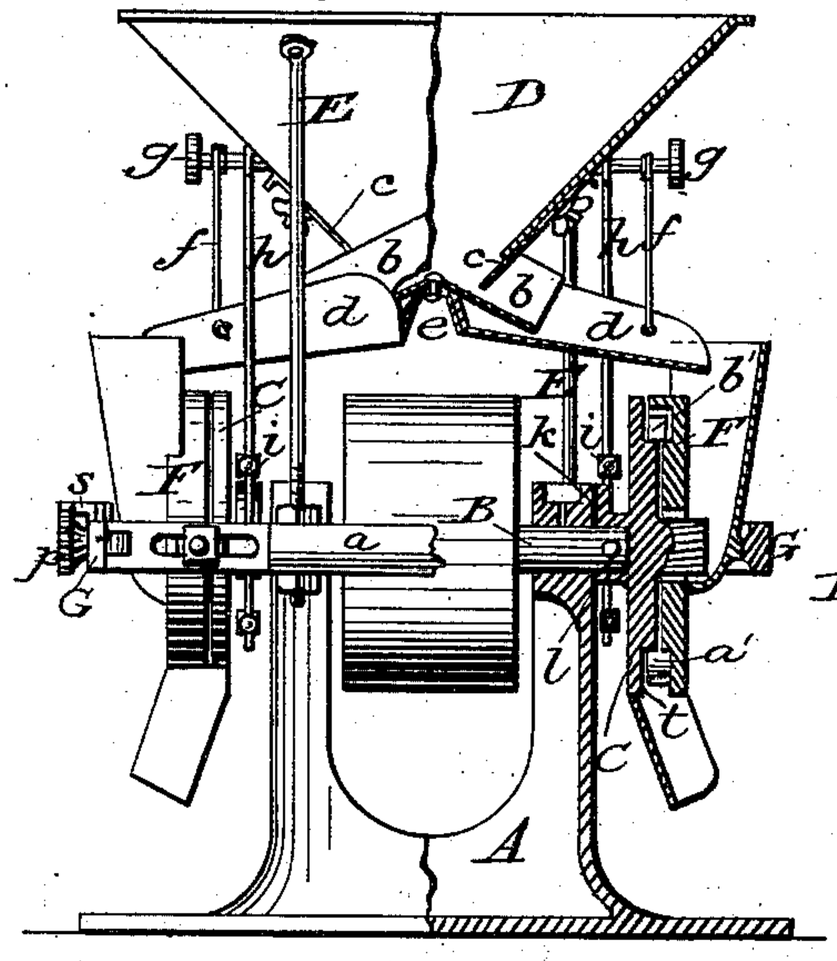


Fig. 1.

Fig. 2



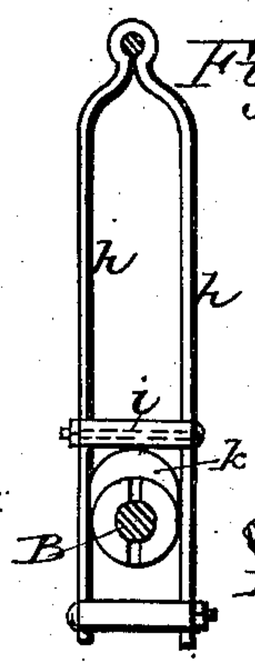
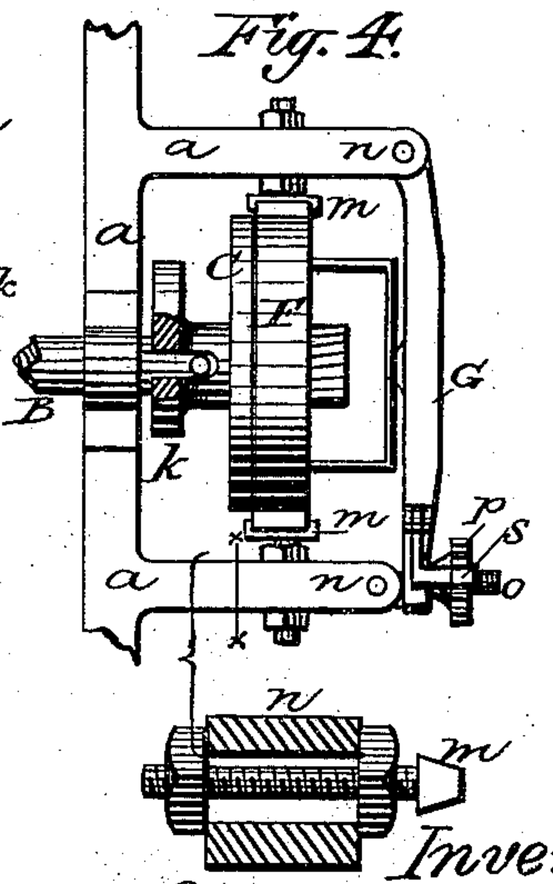


Fig. 3.

Fig. 4.



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(No Model.) 2 Sheets—Sheet 2.

G. & A. RAYMOND.

Grinding Mill

No. 237,599. Patented Feb. 8, 1881.

Fig 5

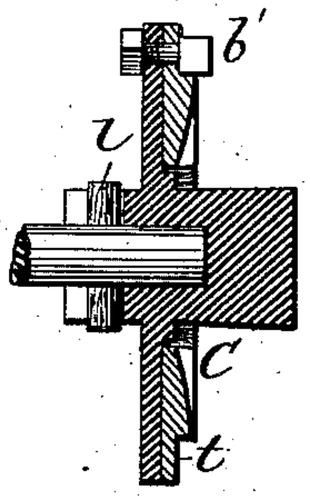


Fig. 6

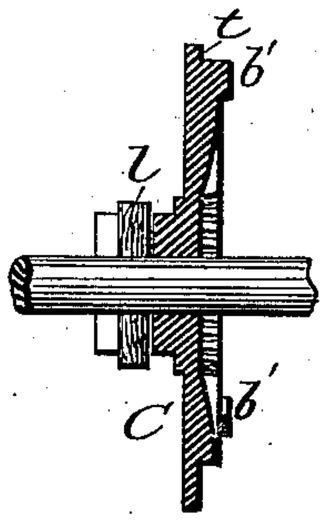


Fig. 7.

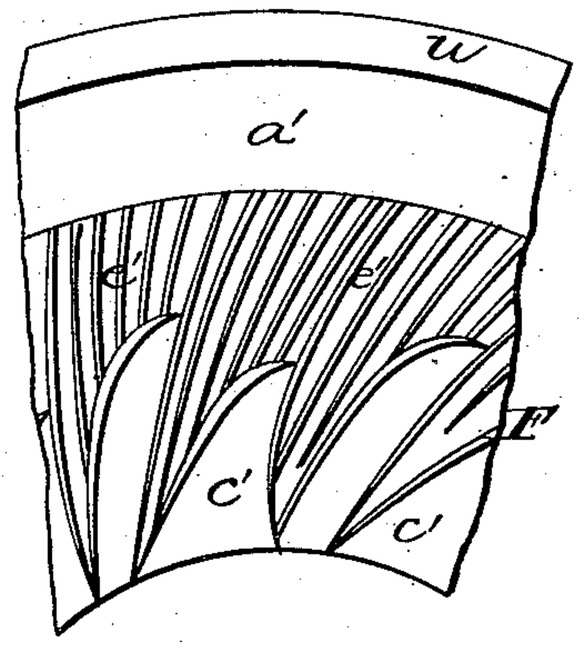


Fig. 8.

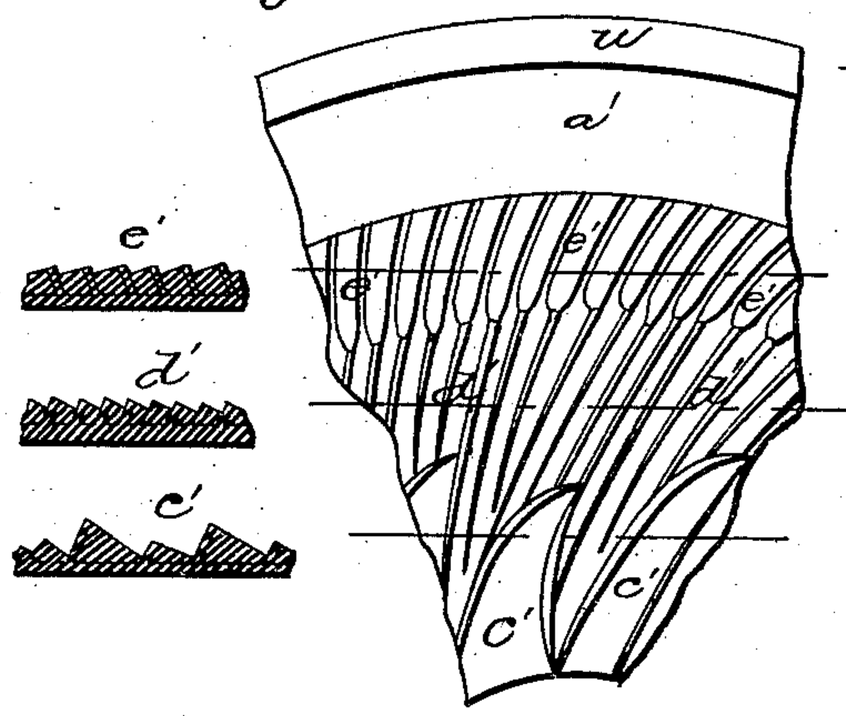


Fig. 9.

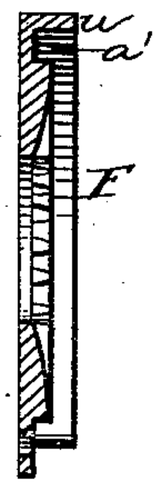


Fig. 10.

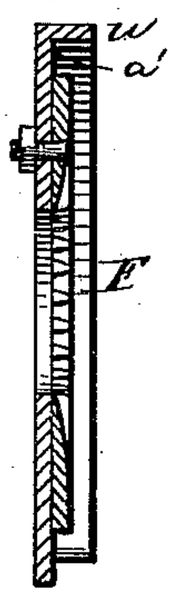


Fig. 11.

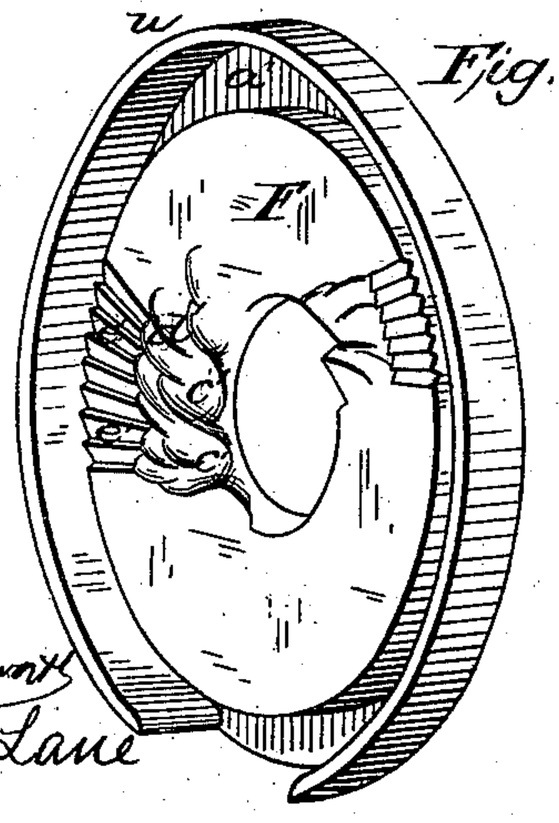
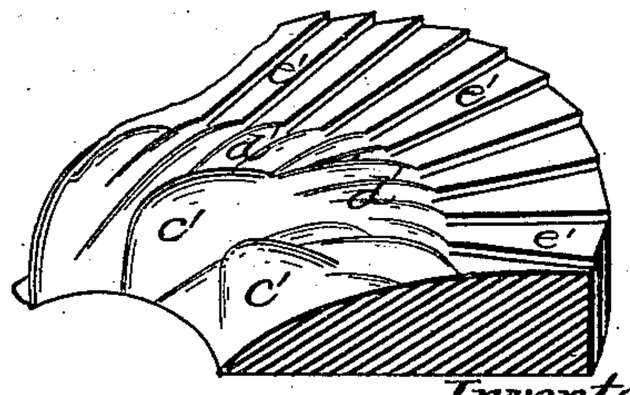


Fig. 12.



Attest.

Sidney P. Hollingsworth
Nathan G. Lane

Inventors.

George Raymond,
Albert Raymond.
By Dodge & Son
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UNITED STATES PATENT OFFICE.

GEORGE RAYMOND AND ALBERT RAYMOND, OF WAUPUN, WISCONSIN.

GRINDING-MILL.

SPECIFICATION forming part of Letters Patent No. 237,599, dated February 8, 1881.

Application filed August 11, 1880. (No model.)

To all whom it may concern:

Be it known that we, GEORGE RAYMOND and ALBERT RAYMOND, of Waupun, in the county of Fond du Lac and State of Wisconsin, have invented certain Improvements in Grinding-Mills, of which the following is a specification.

Our invention relates more particularly to that class of mills in which metallic grinding-disks are employed; and it consists in the construction of various mechanical details, and in the dress of the grinding-surfaces.

The accompanying drawings represent our improvements applied to a double mill, in which form we prefer to construct the same, though the improvements are applicable to single mills as well.

Figure 1 represents a perspective view of the mill complete; Fig. 2, a longitudinal vertical section, showing the arrangement of the feeding devices; Fig. 3, a view illustrating the means for shaking the feeding spout or shoe; Fig. 4, a plan view, illustrating the means for adjusting the grinding-disk; Figs. 5 to 12, inclusive, views illustrating the form, construction, and arrangement of the grinding-disks.

A represents the base-frame of the mill, consisting of an upright divided standard having on the top a rectangular horizontal frame, *a*, provided with bearings or boxes to receive the horizontal main shaft B, the ends of which extend beyond the frame to sustain the rotary grinding-disks C, as hereinafter detailed.

D represents the feed-hopper, supported by four rods, E, the lower ends of which are passed through the top of the base-frame and secured by nuts above and below the same. The hopper has two inclined delivery-spouts, *b*, each having a feed-regulating gate, *c*, adjustably attached to the hopper by a screw, as shown. Beneath each spout there is a vibratory conductor or trough, *d*, inclining downward and outward. These conductors are attached at their inner ends to a suspending-strap, *e*, riveted to the hopper, and are each suspended at the outer end by cords *f*, connected with a winding-shaft or spindle, *g*, mounted on the side of the hopper, as shown, so that by turning the shaft *g* the inclination of the conductor may be changed to aid in controlling the rate of feed. The vibratory motion is imparted to the conductors *d* by pendent shakers *h*, each consisting, as shown in Figs. 1 and 3, of two iron bars or rods, joined at the upper ends and pivoted or otherwise connected to the hopper, while their lower ends, carried down on opposite sides of the conductor, are separated by and bolted against blocks *i*, which admit an eccentric, *k*, secured firmly around the main shaft to work between the bars. The rotation of the eccentric imparts a pendulous vibration to the shaker, which, in turn, vibrates the conductor. As shown in the drawings, the eccentric which actuates the shaker is formed upon or secured firmly to the rotary grinding-disk, which is secured to the driving-shaft by means hereinafter described, which permit the disk to stop whenever a dangerous resistance is encountered. The connection of the eccentric with the grinding-disk, driven as above, is of importance, in that the stoppage of the disk also stops the feeding devices, which would otherwise continue to deliver the corn after the disk had stopped.

The grinding mechanism on each side of the machine consists of two substantially toothed disks, C F, with teeth on their opposing faces. One disk, C, as before mentioned, is attached to the end of the main shaft and rotates therewith, while the other and outer disk, F, is fixed to the frame. In order to prevent breakage of the parts and mutilation of the grinding-teeth in the event of metal, stone, or other hard bodies entering the mill, the inner disk, C, is attached to the shaft and driven by a wooden pin, *l*, inserted through the shaft and bearing at its ends in a notched hub on the back of the disk, as shown in Figs. 4, 5, and 6. In the event of the disk meeting a dangerous resistance the wooden pin will give way and permit the shaft to run on while the disk remains at rest. The hub and pin are exposed, so that the latter may be renewed quickly and without disarranging or disconnecting any of the parts or destroying the adjustment of the mill. The end of the driving-shaft is seated against a solid bearing in the disk, and receives the entire grinding-pressure, to the relief of the pin, thus permitting a comparatively weak pin to be used. This attachment of the disk forms the subject of a separate application, and is not claimed herein.

The outer and stationary disk, F, is sustained by ears formed on its two edges and seated on horizontal guides or ribs *m* on the main or base frame. As shown in the drawings, the rectangular top of the frame has at or near the corners outwardly extending or overhanging ends or arms *n*, and it is to the inside of these arms that the guides are applied, as clearly shown in Figs. 1 and 4.

In order that the two grinding-disks may be adjusted to coincide with one another axially, and to compensate for wear of the shaft and bearings, the guides are made adjustable vertically and also transversely of the machine. This is secured, as shown in Fig. 4, by slotting the arms *n* of the frame and providing the guides with threaded sustaining stems or bolts, which are passed through the slots and secured by nuts on each side of the arm, as shown.

We do not claim herein the broad idea of vertically and laterally adjustable guides, nor do we claim as our invention the threaded shanks or bolts as a means of sustaining and adjusting the guides *m*, the same not being of our invention.

The disk F is slipped upon the guides *m* from the outside of the mill, and can slide thereon to and from the disk C. To hold the disk F inward and apply the required grinding-pressure, we use a swinging bar or bail, G, extending across the outside of the frame and disk, and hinged at one end to one of the arms *n* of the frame, while at the other end it is slotted to receive a swinging bolt, *o*, which is attached to the frame and provided with a pressure-nut, *p*, which acts against the outside of the bar or bail. When the nut is loosened it may be swung back with its bolt, thereby releasing the bar G, which may be swung outward to permit the removal of disk. The bar G is formed with a raised central portion, which bears against the back of the disk F, as shown.

In order to prevent the vibration of the mill from loosening the nut and destroying the adjustment of the mill, the bar G is provided with a latch or dog, *s*, which engages into the notched edge of the nut *p* and prevents the nut from turning.

The grain is admitted to and between the disks through a central eye in the outer disk, and a feed-spout cast on its back and arranged beneath the conductor *d*. A threaded collar on the shaft will draw the grain through the eye of the disk.

In order to discharge the meal at a single point, and to prevent the toothed faces of the disk from coming in contact and injuring each other, the disks are extended outward beyond the grinding-surface and provided, one with a smooth annular surface, *t*, and the other with a corresponding surface encircled by a flange, *u*, extending forward in advance of the grinding-face, as shown in Figs. 2, 9, 10, and 12. The flange *u* runs in close proximity to the outer edge of face *t* and effectually prevents the contact of the grinding-surfaces, and at the same time the annular confined space *a'* within the flange forms a meal-receiving chamber. At the under side the flange which is on the stationary disk is cut away to permit the escape of the meal.

To facilitate the discharge of the meal the rotary disk may have studs *b'* to travel around within the annular meal chamber *a'* and carry the meal to the point of discharge.

The grinding-disks have teeth of such form that at the center the grain is cut by sharp abrupt edges or faces, and that at the periphery the partially-reduced grain is rolled and crushed between backwardly-inclined surfaces.

Figs. 8, 11, and 12 show the form of dress which is considered best. It embraces a series of large teeth, *c'*, at the center, with abrupt cutting-faces on the front, a second series of smaller teeth, *d'*, in the middle, also with abrupt cutting-faces, and a third series of small teeth, *e'*, on the outside, having backwardly-inclined surfaces on the front. The sectional form of the teeth is shown in Fig. 8. The inside teeth are cut downward, with increasing depth toward the center or eye of the disk. At the outer ends they are rounded, as shown. This causes them to rapidly break the grain at the center of the disk, and then cause it to turn and change position as it passes their outer ends to teeth *d'*, instead of lodging in the bottom of the furrow and sliding smoothly outward therein. The teeth *d'* act with a sharp cutting and cracking action, reducing the grain a step beyond the point at which it is left by the center teeth, and then the grain passes to the outside teeth, which act with an easy crushing action by reason of their backward inclination, delivering the meal in a fine and uniformly granulated condition. The essential feature of the dress is the combination of the inner cutting-teeth and the outer crushing or reversed teeth, and so long as this combination is retained the details may be modified as desired and the central teeth, *c'*, or the middle teeth, *d'*, either of them, omitted.

It is apparent that the grinding-face may be cast complete in one piece with the annular ring and backing, as in Figs. 6, 9, and 12, or made separate and bolted or otherwise secured thereto, as in Figs. 5 and 10.

In practice we prefer to cast the rotary grinding-disk with its spiral feeding-head and eccentric complete in one piece, as shown in Figs. 2 and 4, though they may be made separate and secured in any convenient manner.

We are aware that a grinding-disk having its back provided with a central socket and lugs has been driven by means of a spindle the end of which was seated in the socket and provided with rigid metal arms to act against the lugs, and this we do not claim.

Having thus described our invention, what we claim is—

1. The combination of the grinding-disk

having the annular face outside of the grinding-surface and the coacting disk having the peripheral flange, adapted and arranged to run in close proximity to the annular face, as described and shown, for the double purpose of maintaining the separation and parallelism of the grinding-surfaces and of forming a meal-retaining chamber.

2. The combination of the grinding-disk having the annular meal-space surrounding the grinding-face and the peripheral flange surrounding the meal-space, and the coacting disk adapted and arranged to run in close proximity to the flange to retain the meal, and provided with teeth *b'*, traveling in the meal-chamber, as shown.

3. In combination with the pendulous slotted or open shaker, the suspended conductor having its delivery end mounted and arranged for vertical adjustment within the shaker, as described and shown, whereby the motion of the conductor may be varied.

4. In a grinding mill, the combination of two grinding-disks, arranged face to face, each disk provided with a series of central teeth presenting abrupt cutting-edges toward the grain, and also with a series of outer or peripheral teeth presenting backwardly-inclined faces toward the grain, as described and shown, whereby the grain is first cut between two opposing sharp edges and subsequently crushed between two inclined faces.

5. The combination of the driving shaft, the grinding-disk secured to the shaft by safety devices, the eccentric secured to said grinding-disk, and the feeding devices operated by the eccentric, substantially as described, whereby the stoppage of the disk is caused to stop the feeding devices, while the motion of the driving-shaft is continued.

GEORGE RAYMOND.
ALBERT RAYMOND.

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PETER HOBLER.

Witnesses as to the signature of Albert Raymond:

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WILLIAM HENRY TAYLOR.