No. 764,071. PATENTED JULY 5, 1904.

A. H. PATCH.

GRINDING MILL.

APPLICATION FILED APR. 18, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

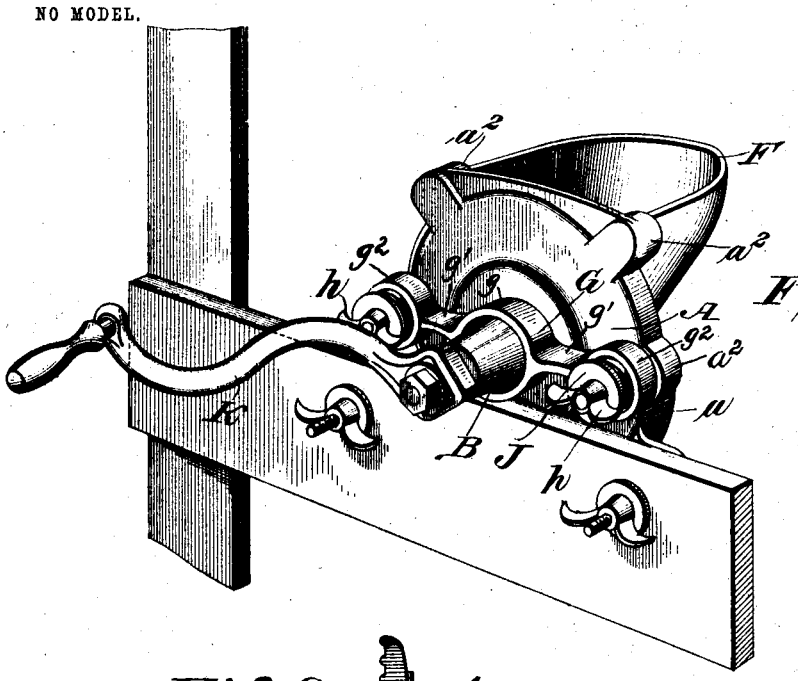

Fig. 1.

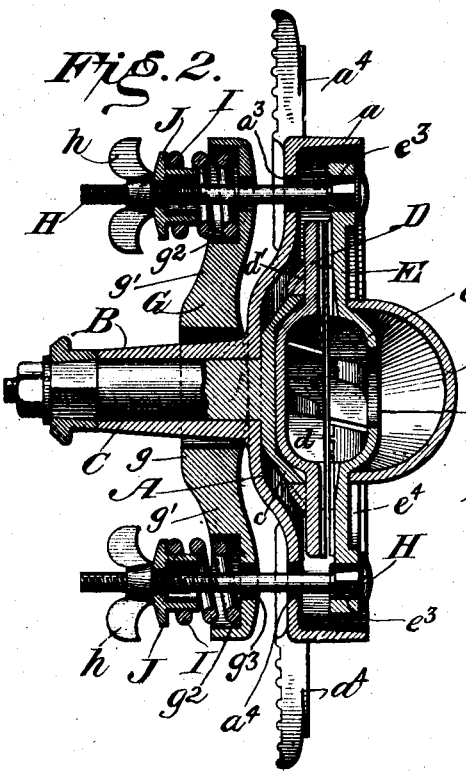

Fig. 2.

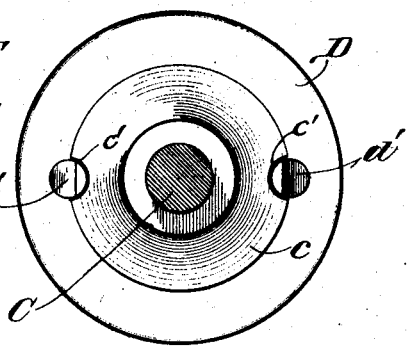

Fig. 3.

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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 4.

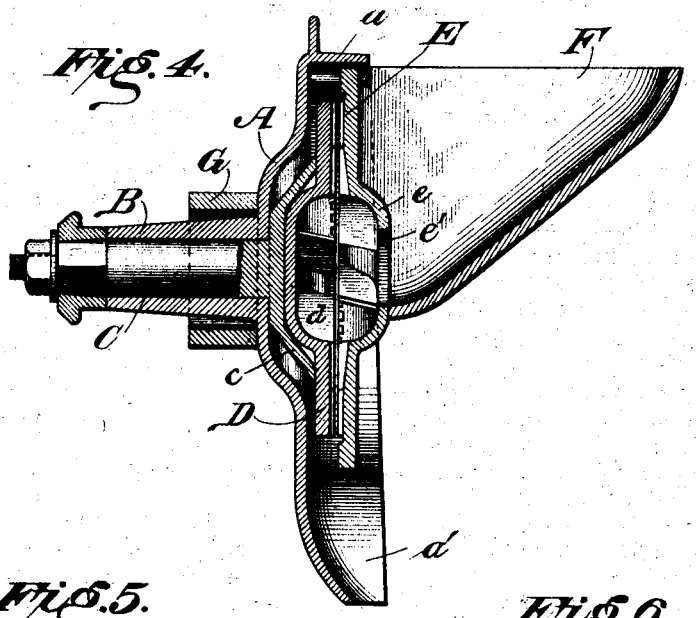


Fig. 5.

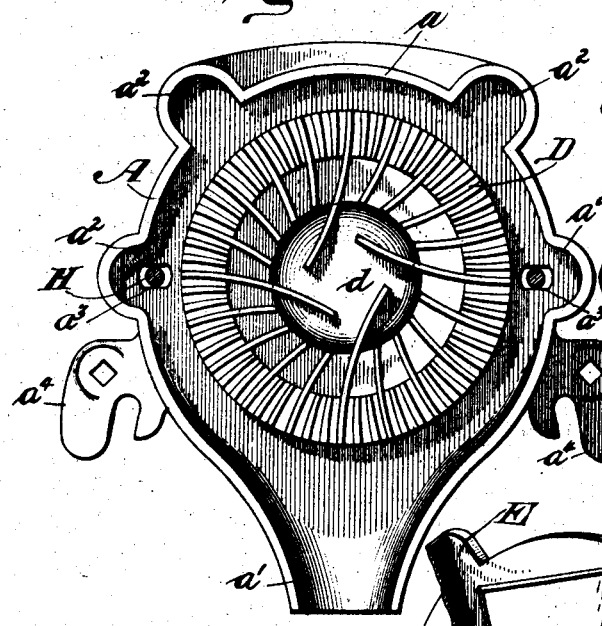


Fig. 6.

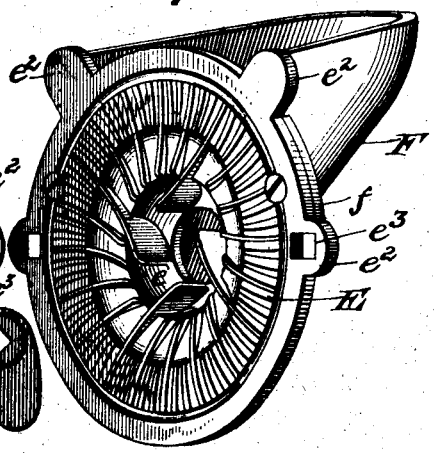
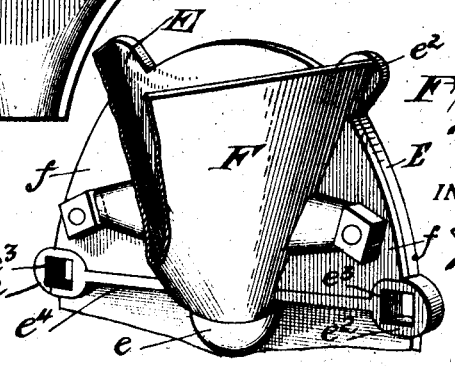


Fig. 7.



WITNESSES

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UNITED STATES PATENT OFFICE.

ASAHEL H. PATCH, OF CLARKSVILLE, TENNESSEE.

GRINDING-MILL.

SPECIFICATION forming part of Letters Patent No. 764,071, dated July 5, 1904.

Application filed April 18, 1902. Serial No. 103,608. (No model.)

To all whom it may concern:

Be it known that I, ASAHEL H. PATCH, a citizen of the United States, residing at Clarksville, in the county of Montgomery and State of Tennessee, have invented certain new and useful Improvements in Grinding-Mills; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to grinding-mills, and more particularly to that type wherein the grain is ground between rotary and stationary metal grinding-plates.

The objects of the invention are, first, to provide an efficient mill of this character of light compact construction and composed of few, simple, and inexpensively-formed parts which may be easily assembled or taken apart or replaced by new parts when worn or damaged; second, to provide a construction whereby the mill when set up may be opened or separated between the grinding plates or disks for access to the grinding surfaces and bearings for cleaning and oiling; third, to support the rotary grinding plate or runner in such manner as to secure uniform action with the stationary grinding-plate and also in such manner as to permit its removal from the spindle when the mill is opened without detachment of other parts; fourth, to maintain a uniform yieldable pressure between the grinding-plates and to provide for adjustment of the pressure to maintain the grinding-surfaces in proper relation and for the purpose of grinding with different degrees of fineness; fifth, to improve the construction and arrangement of the grinding plates or disks and to secure a maximum grinding capacity, and, finally, to improve generally upon devices of this same character.

With the above-stated objects in view the invention will hereinafter be fully described, with reference to the accompanying drawings, which form a part of this specification, and then pointed out in the claims following this description.

In said drawings, wherein corresponding parts in the several views are designated by the same reference characters, Figure 1 is a perspective view of a hand grinding-mill embodying my invention. Fig. 2 is a horizontal section thereof. Fig. 3 is a detail view, in rear elevation, of the rotary grinding plate or disk and adjacent end of its spindle, showing the mode of attachment of the disk. Fig. 4 is a vertical section taken longitudinally of the spindle. Fig. 5 is a detail elevation showing the inner side of the frame and the grinding-face of the rotary disk. Fig. 6 is a perspective view of the hopper and fixed grinding plate or disk, showing the grinding-face of the latter; and Fig. 7 is a fragmentary perspective view of the outer side of the hopper and fixed grinding-plate, showing the mode of fastening them together.

The mill herein illustrated is of the vertical-disk type and comprises in the main a frame-plate A, having a tubular bearing-boss B projecting centrally from one side and a rim or flange *a* projecting from the other side, a spindle C, journaled in said bearing-boss and carrying a rotary grinding plate or disk D, mounted to rotate within the rim or flange *a*, a fixed co-operating grinding-plate E, fitted and secured within the flange of the frame-plate, a hopper F, formed with or secured to the outer face of the fixed grinding-plate, a pressure-equalizing yoke G, fitted over the bearing or boss B, fastening-bolts H and thumb-nuts *h*, securing the frame-plate, fixed grinding-plate, and arms of the yoke together, and an operating-crank K, mounted on the outer end of the spindle. The plate A constitutes the frame of the mill, and said plate, with the fixed grinding-plate, constitute the entire mill-casing. All the parts may be made of cast-iron or other suitable metal finished and placed together direct at the foundry.

As shown more clearly in Figs. 4 and 5, the frame-plate A of the present structure is concavo-convex in form, and the rim or flange *a* thereof terminates at the lower end of a suitable spout *a'* for discharge of the ground material. The frame-plate or rim thereof is also formed, preferably at diametrically opposite horizontally-disposed points and at other suitable points, with U-shaped or other

suitable bends a^2, which constitute sockets to receive correspondingly-disposed lugs or ears e^2 on the fixed grinding-plate when the parts are fitted in place.

The frame-plate may be formed with or mounted on a suitable base or support, but in the present construction is provided with a pair of oppositely-arranged lugs or ears a^4, each having a bolt-hole and an open-ended slot, either of which may be used in connection with fastening bolts and nuts for securing the mill to a beam or other support, as represented in Fig. 1. When the slots are used, the mill may be readily removed from its support simply by loosening the thumb-nuts.

The spindle C is formed or provided at its inner end with a concavo-convex or saucer-like plate c, which rotates within the similarly-formed or concave inner face or side of the frame A and supports the rotary grinding plate or disk D. Said plate c has only a slight annular bearing at its base against said inner side of the frame, sufficient to resist the thrust or pressure exerted by the fixed grinding-plate, its rim being separated from the frame, so as to reduce the bearing-surfaces and prevent undue friction.

The grinding-plates D and E are of similar construction and consist, preferably, of thin flat disks having pronounced central concavo-convex portions d and e, the concavities of which are formed in the grinding-faces and constitute when the disks are placed together a central space or chamber into which the grain is fed from the hopper through an aperture or eye e' in the stationary grinding-plate. In other constructions the disks may be thicker and formed with their outer faces wholly flat instead of convex at the centers, though the form described is preferred for the purposes of lightness and compactness.

The outer convexity d of the rotary grinding-disk fits within the similarly-formed plate c, and said disk is secured to or supported by said plate c by means of a pair of oppositely-disposed lugs d' on the outer face of the disk engaging correspondingly-disposed notches c' in the edge of the plate or recesses in said plate or by equivalent or other suitable means. The disk is thus properly supported and caused to rotate with the spindle, but is not rigidly attached to said spindle, being thus permitted to vibrate slightly to adjust or accommodate itself to the opposed face of the fixed grinding-plate, thereby aiding in securing steady and uniform action. Also by reason of such means of attachment the said rotary grinding plate or disk may be attached or detached directly when the mill is opened in the manner hereinafter explained without detachment of other parts or manipulation of any fastening devices.

The fixed grinding-plate E is of proper peripheral form to fit within the flange of the frame A, having, as before mentioned, suitably-disposed lugs e^2, which set within the correspondingly-disposed sockets a^2 of said frame. A rigid close-fitting structure is thus provided, and the grinding-plates are properly housed and protected from the entrance of foreign bodies. The two lower or oppositely-disposed lugs e^2 on the fixed plate are provided with apertures e^3, which receive the heads of the fastening-bolts H, which latter extend through registering slots or apertures a^3 in the corresponding socketed projections a^2 of the frame-plate and also through registering apertures g^3 in the arms of the pressure-equalizing yoke G. The said yoke consists, substantially, of a medial ring or sleeve g, which fits over the tubular spindle-bearing B against the frame-plate, and oppositely-projecting yoke-arms g', formed with outwardly-facing sockets g^2, which are centrally provided with the above-mentioned bolt holes or apertures g^3. Fitted in said sockets g^2 and inclosing the bolts are stout spiral compression-springs I. The thumb-nuts h are screwed on the threaded ends of the bolts against the resistance of the springs, suitable washers J being interposed to afford abutments for the springs and bearings for the nuts. As shown, the washers consist, preferably, of flanged caps or rings, the tubular parts of which are inclosed within the outer ends of the spiral springs to retain the washers in proper place. The grinding-plates are thus drawn together under a yieldable pressure, permitting accommodation of the grinding-faces upon each other, and by means of the thumb-screws the pressure may be adjusted to maintain the disks in proper relation and secure uniform action and smooth steady movement or to grind with different degrees of fineness, as desired. As shown in Figs. 2 and 4, the central ring portion g of the yoke is preferably slightly curved and bears against the outer central convexity of the frame-plate at diametrically opposite points, and the yoke-arms are wholly separated from the frame-plate, permitting nicety of adjustment. The arrangement of fastening devices may of course be varied, and, if desired, the spiral springs may be dispensed with; but said springs are preferred, since they permit a yielding pressure between the grinding-plates and aid in giving a smooth rotation of the crank or other operating device.

The hopper F may be of any suitable form and may be cast integrally with or attached to the outer face or side of the fixed grinding-plate, though it is more practical to cast the pieces separately. In the construction shown the hopper consists of a suitable chute-like part, the lower diverging portion of which fits the outer convexity of the grinding-plate beneath the eye or feed-aperture e' and is formed at opposite sides with lugs f, secured by screws and nuts or other suitable means to

the grinding-plate, the lower edges of said lugs *f* fitting against a rib e^4 across the outer face of the plate, as shown in Fig. 7.

It will be observed that the structure described is exceedingly simple, light, and compact and that the parts may be readily assembled and taken apart or replaced by new parts, so that repairs may be furnished cheaply. When set up for use, as represented in Fig. 1, the mill may be opened by loosening one of the thumb-nuts *h*, unfastening the other nut, and withdrawing the bolt, whereupon the fixed grinding-plate and hopper will swing aside to permit the mill to be cleaned or its bearings oiled.

As shown in Figs. 5 and 6, the two grinding-faces have substantially similar dress, though when the disks are placed together the breaking and grinding ribs incline in opposite directions or cross each other, giving to the grooved and ribbed surfaces a shearing action upon each other. Each grinding-face may be said to comprise three circular or annular sections—viz., the central circular concavities *d* and *e*, an intermediate annular section, one or both of which may be slightly concaved, as shown in Figs. 4 and 6, and an outer or skirt section. The skirt-section is formed with short comparatively slight closely-arranged grinding-ribs, a certain number of which extend in a tangential direction across the intermediate section, while a lesser number (four in the present construction) extend tangentially clear into the central concavity of inner section, where they are increased in size or prominence and constitute large or coarse breaking-ribs. In operation the grain being fed from the hopper between the disks through the central eye e' in the fixed grinding-plate is thus introduced in its greatest bulk into the comparatively large central space or chamber formed by the confronting concavities *d* and *e*, where it is cracked and broken by the larger breaking-ribs. The broken grain then passes by centrifugal force to the intermediate annular section, where it is broken finer and partially ground, then to the skirt-section, where it is ground fine by the closely-arranged curved ribs and grooves, and finally falls through the spout a' into a suitable receptacle. By virtue of the construction described the corn or other grain may be fed to the disks as rapidly as the outer grinding-ribs and grooves can grind, thus securing a maximum grinding capacity.

While I have illustrated herein a hand-operated mill of the vertical-disk-action type, it will be understood that the invention is independent of the particular embodiment, and certain features thereof are equally applicable to mills of the horizontal-disk-action or other types. The mill is also susceptible of various modifications in details of construction and arrangement without departing from the scope of the invention.

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

1. In a grinding-mill, a frame-plate having a bearing-boss projecting from one side and a rim or flange projecting from the opposite side and formed with U-shaped bends, a spindle journaled in said bearing-boss and carrying a rotary grinding-plate mounted to rotate within said rim or flange, and a coöperating fixed grinding-plate fitted and secured within said rim or flange and having correspondingly-disposed lugs fitting within the bends thereof.

2. In a grinding-mill, a concavo-convex frame-plate having a bearing-boss projecting centrally from its convex side and a rim or flange projecting from the other side, a spindle journaled in said bearing-boss having an end plate occupying the central concavity of the frame-plate and bearing against the inner side thereof, a rotary grinding-plate removably mounted on said spindle-plate so as to rotate within said rim or flange, a coöperating fixed grinding-plate fitted and secured within said rim or flange, and means for sustaining said fixed grinding-plate in proper relation against said rotary grinding-plate.

3. In a grinding-mill, the combination of a concavo-convex frame-plate having a bearing-boss projecting centrally from its convex side, a spindle journaled in said bearing-boss having a concave or saucer-like plate at its inner end occupying the central concavity of the frame-plate, a flat grinding-plate having a central concavo-convex portion supported by said spindle-plate with its convexity occupying the concavity of said spindle-plate, and a similar coöperating grinding-plate having a central eye and fitted and secured within the flange of the frame-plate in proper relation against the former grinding-plate.

4. In a vertical-disk grinding-mill, the combination of an upright frame-plate having a bearing-boss projecting from one side and a rim or flange projecting from the other side, a spindle journaled in said bearing-boss, a centrally-concave rotary grinding-plate mounted on the inner end of said spindle, a similar cooperating fixed grinding-plate fitted and secured within said rim or flange and having a central eye, a hopper secured to its outer side, and adjustable fastening devices connecting the frame-plate and fixed grinding-plate and holding the latter in proper relation against the rotary grinding-plate.

5. In a grinding-mill, the combination of a frame-plate having a bearing-boss projecting from one side and a rim or flange projecting from the other side, a spindle journaled in said boss carrying a rotary grinding-plate mounted to rotate within said rim or flange, a coöperating fixed grinding-plate fitted within said rim or flange, means for preventing rotation thereof, a yoke having a medial bearing directly against the outer side of the

frame-plate, and bolt-and-nut fastenings connecting the arms of the yoke with the fixed grinding-plate and drawing the latter inward against the rotary grinding-plate.

6. In a grinding-mill, the combination of a frame-plate having a bearing-boss projecting from one side, a spindle journaled therein carrying a rotary grinding-plate adjacent to the opposite side of said frame-plate, a confronting non-rotatable grinding-plate, a yoke having a medial bearing around said boss, and yieldable fastening devices connecting the arms of the yoke with the non-rotatable grinding-plate and holding the latter under yielding pressure against the rotary grinding-plate.

7. In a grinding-mill, the combination of a frame having a bearing, a spindle journaled therein, a rotary grinding-plate mounted on said spindle adjacent to the inner side of the frame, a coöperating stationary grinding-plate, a yoke having a medial bearing against the outer side of the frame and having oppositely-projecting arms each formed with an outwardly-facing socket, fastening-bolts inserted through registering apertures in the stationary grinding-plate, frame, and sockets, and spiral compression-springs fitted in said sockets between the same and the nuts or bolt-heads; substantially as described.

8. In a grinding-mill, the combination of a concavo-convex frame-plate having a central bearing-boss projecting from its convex side, a spindle journaled in said boss having formed at its inner end a plate occupying the concavity of the frame-plate, a rotary grinding-plate removably secured to the face of said spindle-plate, a coöperating fixed or non-rotatable grinding-plate, means for preventing non-rotation thereof, a centrally-apertured yoke fitted over said boss and having oppositely-extending yoke-arms, and yieldable bolt-and-nut fastenings connecting said yoke-arm with the stationary grinding-plate.

9. In a grinding-mill, the combination of a suitably-journaled spindle formed with a concave or saucer-like plate at its inner end, a rotary grinding-plate having a central concavo-convex portion removably supported by said spindle-plate with its outer convexity occupying the concavity thereof, and a coöperating grinding-plate supported in proper relation against said rotary grinding-plate and holding the latter against its said saucer-like supporting-plate; substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

ASAHEL H. PATCH.

Witnesses:
A. C. BURCHETT,
B. A. PATCH.