(No Model.) 2 Sheets—Sheet 1.

J. S. WOODCOCK.

GRINDING MILL.

No. 382,202. Patented May 1, 1888.

Fig. 4

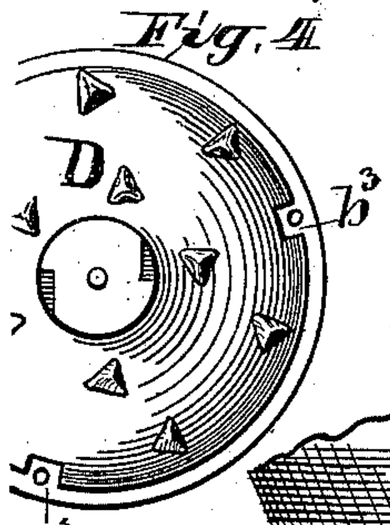


Fig. 6

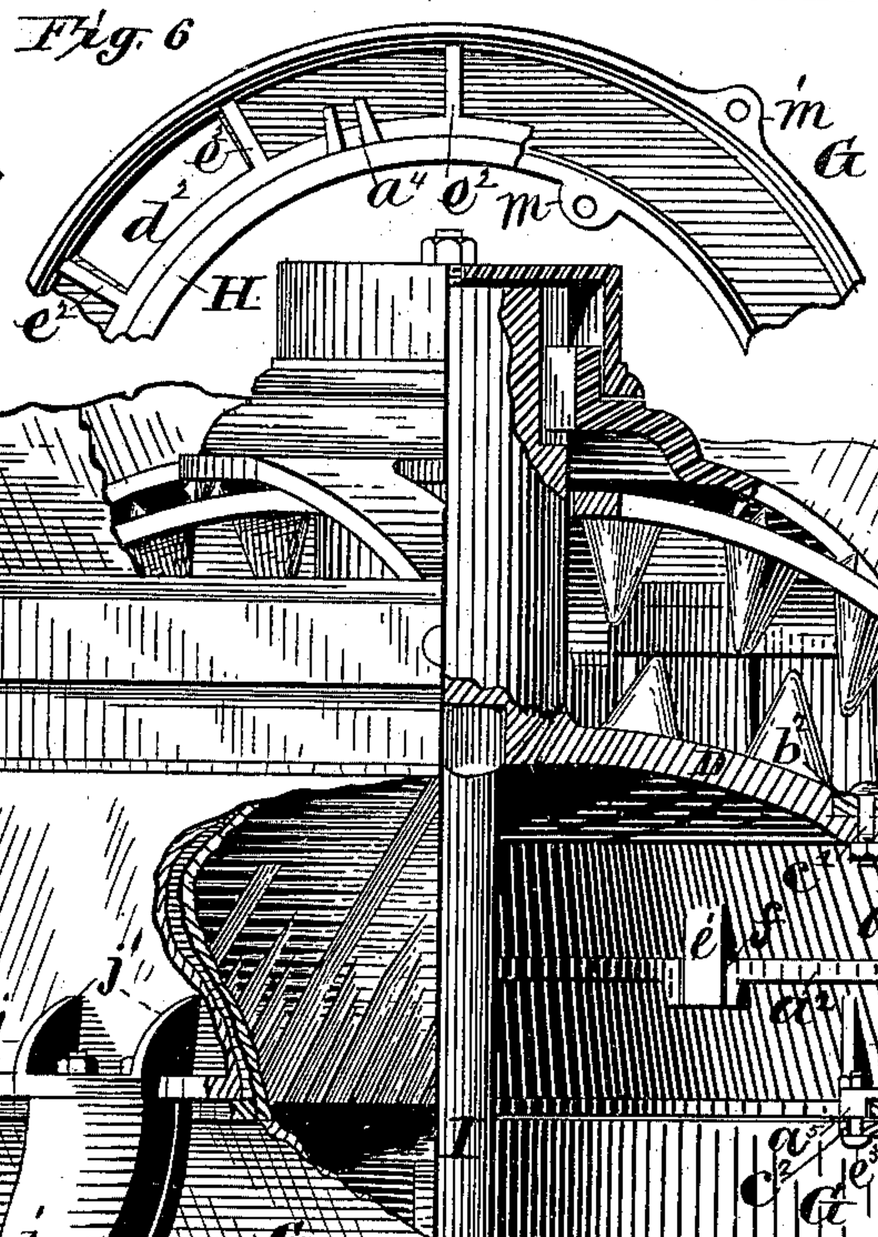


Fig. 5

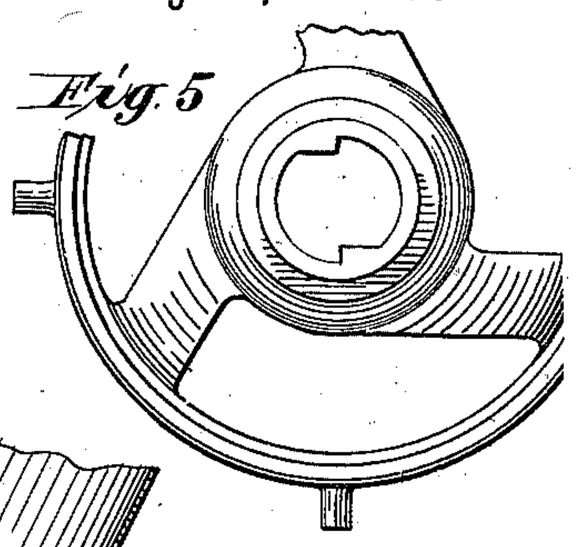


Fig. 1.

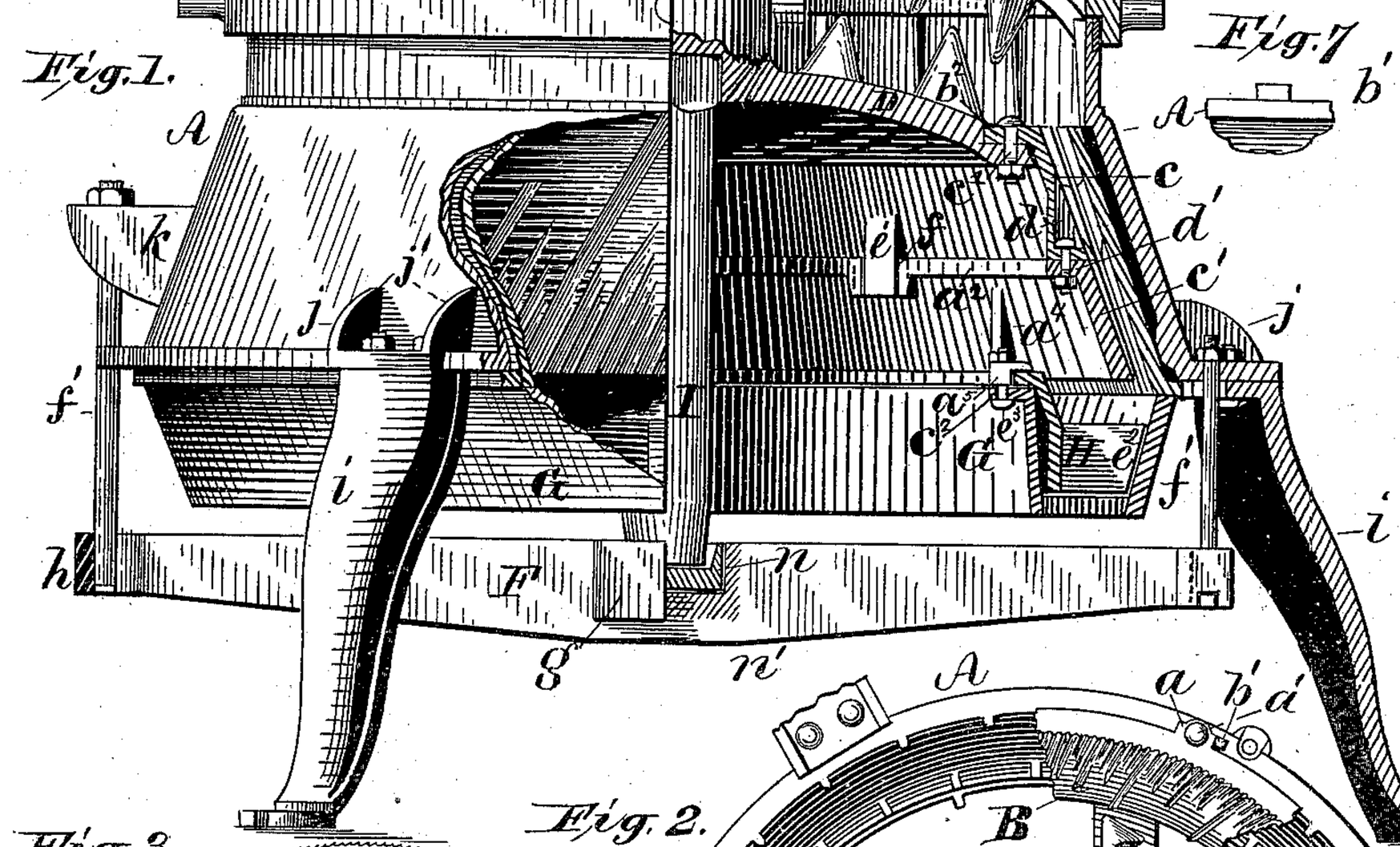


Fig. 7

Fig. 3

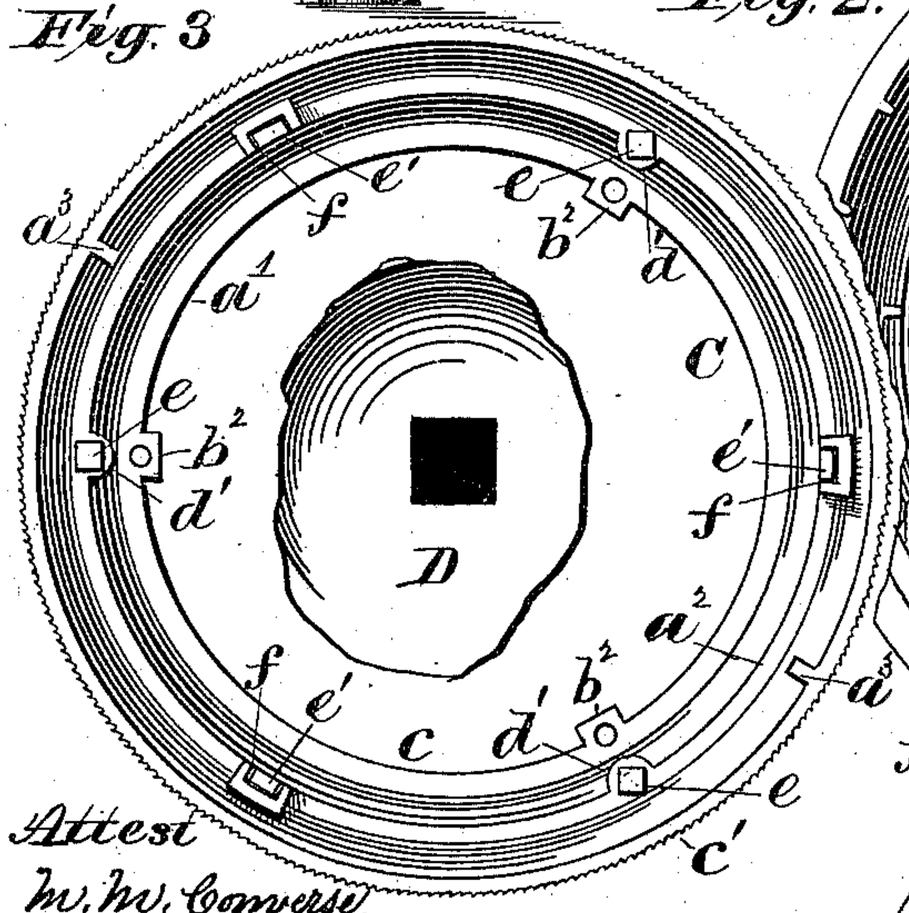
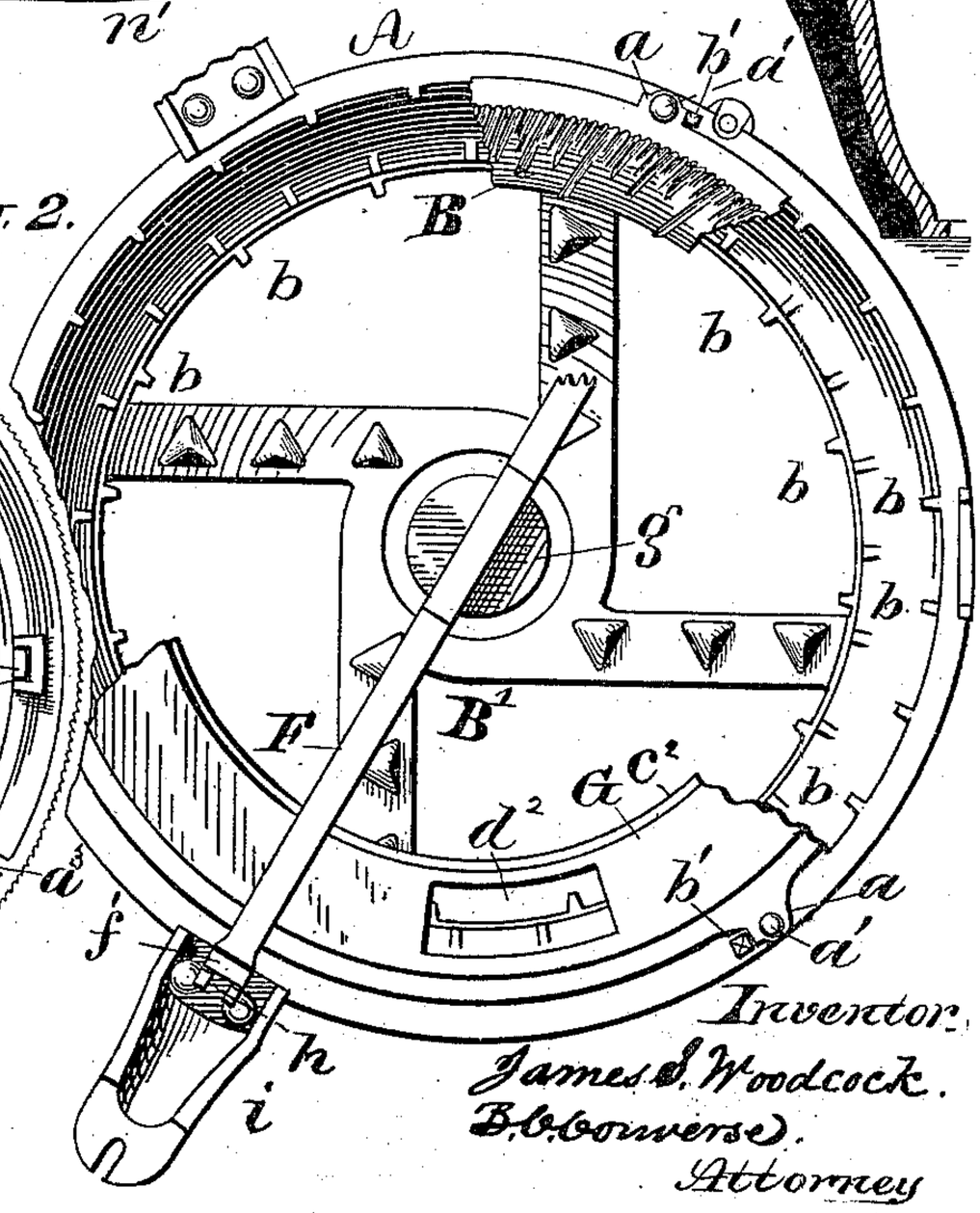


Fig. 2.



Attest
W. W. Converse.
F. White.

Inventor.
James S. Woodcock.
B. B. Converse.
Attorney

(No Model.) 2 Sheets—Sheet 2.

J. S. WOODCOCK.

GRINDING MILL.

No. 382,202. Patented May 1, 1888.

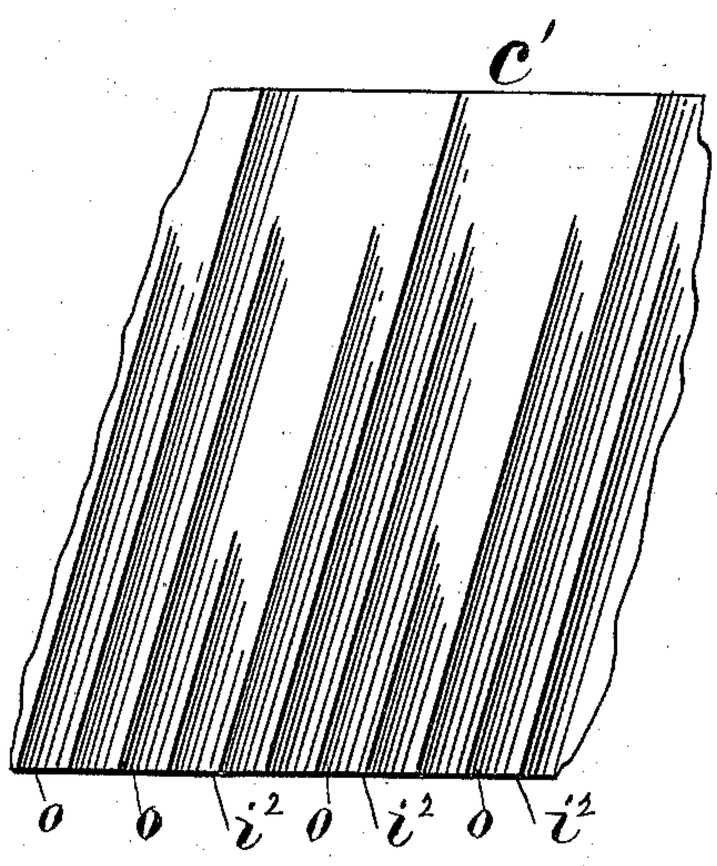


Fig. 8.

Fig. 9.

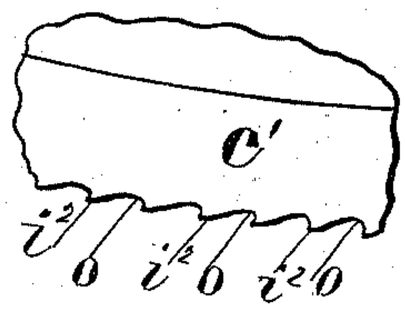
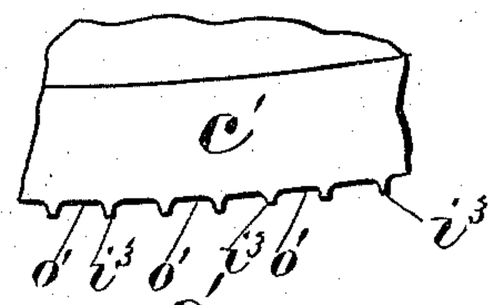


Fig. 11.



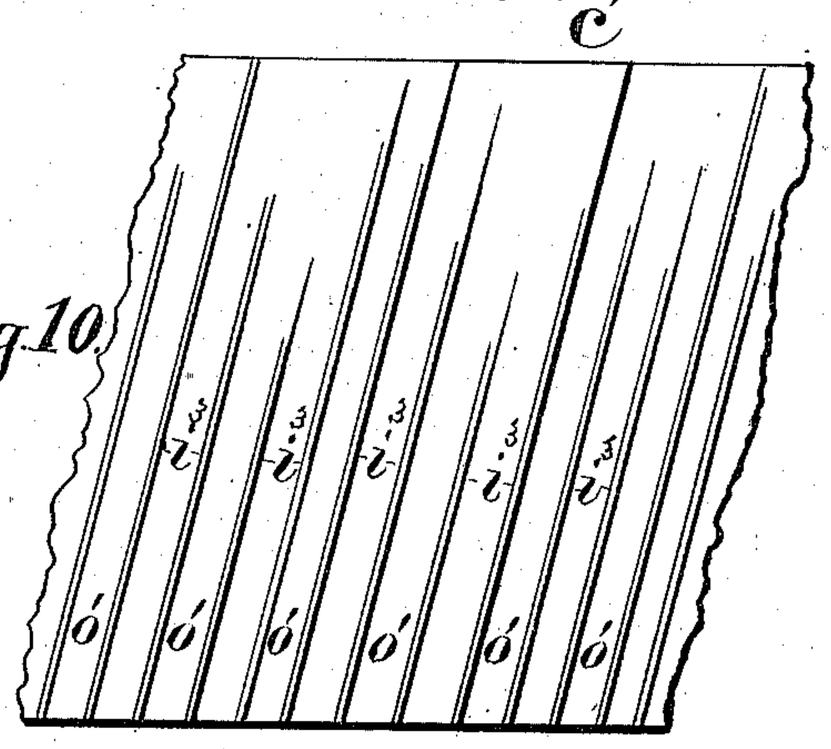


Fig. 10.

Witnesses.
M. M. Converse.
L. White.

Inventor.
James S. Woodcock.
B. C. Converse.
Attorney

UNITED STATES PATENT OFFICE.

JAMES S. WOODCOCK, OF NEW LEXINGTON, OHIO.

GRINDING-MILL.

SPECIFICATION forming part of Letters Patent No. 382,202, dated May 1, 1888.

Application filed May 26, 1887. Serial No. 239,400. (No model.)

To all whom it may concern:

Be it known that I, JAMES S. WOODCOCK, a citizen of the United States, residing at New Lexington, in the county of Perry and State of Ohio, have invented certain new and useful Improvements in Grinding-Mills; and I do 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, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in grinding-mills.

My invention relates to that class of grinding-mills used for grinding feed for stock, &c., in which horizontally-rotating burrs are used, and is an improvement on Patent No. 213,273, issued to John W. Woodcock and Samuel J. Woodcock, March 11, 1879; and it consists in certain new and useful improvements in the several parts by which the mill is more easily fitted up, and its construction thereby cheapened; in means for taking the strain off the connecting-bolts, and at the same time increasing the strength and efficiency of the mill; in improved means for discharging the ground meal, and in an improved construction of the teeth of the grinding-burrs, together with other parts, all of which is fully described in the specification, and is more particularly pointed out and set forth in the claims.

Figure 1 is an elevation of my improved grinding-mill, partly shown in section to exhibit the interior parts. Fig. 2 is a view, from the under side, of the case with a part of the outer or female grinding-burr as attached to the latter, the meal-trough, and the bridge-tree. Fig. 3 is a view, from the under side, of the inner or male grinding-burr with a portion of the top plate of the same where it rests on the spindle or supporting-shaft. Fig. 4 is a top view of the top or cap plate. Fig. 5 is a top view of the spider-plate. Fig. 6 is a view, from the top, of a part of the meal-trough and the conveyer operating in the latter. Fig. 7 is a view of one of the bosses or studs on the under side of the lower flange of the case, shown in elevation, inverted. Fig. 8, Sheet 2, is an elevation of a portion of the inner grinding-burr having my improved teeth for grinding coarse feed, as corn in the ear, and also damp grain. Fig. 9 is a plan view of the same. Fig. 10 is an elevation of a portion of the grinding-burr used for small grain and for fine meal. Fig. 11 is a plan view of the same.

In external appearance the mill is much like that shown in the patent mentioned; but its construction is different. It consists of a shell or case of frustum shape, A, supported upon legs, with an outer female burr, B, having teeth on its inner surface. This burr is fitted within the case A and secured thereto, differing from that represented in the patent mentioned, which has teeth on the inner surface of the case A, in which case the burr cannot be renewed when worn out without renewing the entire case.

The burr B is bolted to the outer case, A, by lugs *a a*, which extend out from the lower edge onto the lower rim or flange of the case. The inner surface of the case A is provided with small projecting ribs *b b*, the object of which is to lessen the labor and expense of fitting, as otherwise, in case of the outer surface of burr B being uneven or a little too large to fit into A, the whole or nearly the whole inner surface of the latter must necessarily be chipped off or turned out to fit B therein, as the latter, being of extremely hard iron, could not be turned off, whereas in this case only the small ribs *b b* require to be cut away to make the fit as complete as required. The lugs *a a* have one side with a straight (radial) edge. This fits snugly against the rectangular studs *b' b'* (seen on the under side of the lower rim of the case A) and prevents shearing off the bolts *a' a'*, which secure the burr and case together, the direction of the strain being toward the studs.

The inner or male burr, C, unlike that shown in the before-mentioned patent, is divided into two sections horizontally about the middle. The two sections *c* and *c'* are connected together by bolts extending through the bottom of recesses *d d* in the upper section, *c*, and the inner lugs, *d' d'*, of the lower section, thus securing the two sections firmly together. The advantage of making the burr C in two sections is to allow the lower section, *c'*, (which is first to wear out,) to be easily taken out and replaced by a new one. Besides the three opposite lugs on

either section, which are connected by bolts *e e*, there are three long flat rectangular (vertical) lugs, *e' e'*, which extend downward from the inner wall of the upper section, *c*, into the recesses *f f* of the lower section, which are cast on the inner wall of the latter in the same horizontal plane with its inner projecting flange, a^2. (Seen extending around the upper line of section *c'*, where it joins onto the lower edge of the upper section, *c*, Fig. 1.) These lugs fit snugly into the recesses *f f*, and thus take the strain off from the connecting-bolts *e e e*, besides adding strength to the connections of the two sections of the burr. On the inner edge of the upper section are rectangular lugs b^2 b^2, which fit into recesses or depressions b^3 b^3 of like shape on the dome-plate D, as seen in Figs. 1, 3, and 4. By this means all shearing or cross-strain on bolts *c' c'*, which connect the dome-plate and top section of burr together through the lugs b^2 b^2, is avoided.

In Fig. 1, on the right, the manner of attaching the dome-plate D is seen, the lug and the latter being shown in vertical section with the connecting-bolt *c'*. The dome-plate, instead of being placed over the outside of the section *c*, is made small enough to be inserted from the inside. It has a level flanged edge outside of the convex part, which fits the under side of the interior top flange, *a'*, of section *c*, the bolts *c'* being inserted from the top through the lugs b^2 and secured by a nut on the inside, as seen in Fig. 1. In this form of construction the entire weight of the burr-sections is carried by the dome-plate itself, instead of by the connecting-bolts *c'* alone, which would be the case were the dome-plate placed on the outside. Therefore all longitudinal strain on the bolts *c'* is also obviated, and in connection with the lugs and recesses, already described, the burr C is made stronger and more durable. In the patent before mentioned this burr is constructed in a single piece; but as the casting (being large and heavy) is liable to be uneven and irregular, and in consequence not easily fitted to the case A, I have made it in three pieces, as described, so that a defect in any one of the three sections will not require the renewing of the entire burr; but any one of them can be replaced when required. The legs are attached to the under side of a projecting ear, *j*, which is connected with the side of the case by quadrant-shaped braces *j' j'* on either edge, as seen in Fig. 1.

The spindle or shaft I, which supports the running burr by being inserted through the dome-plate D, is stepped into a small cup-shaped box, *n*, in the large circular bearing *g* at the center of the bridge-tree F. This latter, instead of having three arms, simply consists of a single straight bar broadened at the middle (vertically) to give it sufficient strength. It is suspended by the two T-headed bolts *f' f'*, one of these latter extending through a hole in the top of one of the legs *i* and the ear *j*, to which the leg is attached, as seen in Figs. 1 and 2. The head end of bolts *f' f'* is held in a notch in the under side of the bridge-tree F at each end, and a longitudinal mortise, *h*, cut out from the bolt to the end allows the bolts to be easily slipped into or taken out of their places, making it convenient to remove the bridge-tree in changing or renewing the grinding-burrs. The opposite end of the bridge-tree is suspended by its bolt *f'* from the ear *k*. (Seen projecting from the wall of case A above the base-ring.) The spindle I having a square end entering a hole of like shape in the dome-plate D (as in the patent mentioned) loosely, the burr C readily adjusts itself, being aided by the bridge-tree, suspended, as described, so that when in operation the burr is in running balance.

A meal-trough, G, in the form of an annular ring, is bolted to the bottom of the case under the opening between the burrs. The same bolts, *a'*, which secure the burr B to the case also fasten trough G on the outside through lugs *m'* to the case A. On the inner edge are lugs *m*, through which a bolt, e^3, secures a spacing-clip, a^5, which latter extends over the top edge of a ring conveyer, H, (seen in Figs. 1, 2, and 6,) which lies loosely within trough G, and is carried around by means of the inwardly-projecting lugs a^3 on burr C, which engage the opening between the outwardly-extending fork-lugs a^4 at the top part of conveyer H.

By reference to Fig. 1 it will be noticed that the conveyer H has its wall inclined inward from about the middle horizontal line upward (embracing about one-half its depth) to correspond with the inclination of the inner wall of the trough G and to give clearance. The conveyer is provided with a series of blades or wings, e^2, extending radially across the trough therefrom to force the ground material around the trough to the discharge-hole d^2. (Seen in the bottom of the latter, Figs. 2 and 6.) To give the conveyer clearance at the bottom and prevent undue friction against the bottom of trough G, the conveyer has a flange, c^2, extending over the top of the inner wall of trough G, which also serves to keep it parallel. The inclination of the upper half of its wall above blades e^2 is greater than that of the trough, so that only the lower edge of the conveyer at its inner angle can touch the face of the trough-wall while in operation. Sufficient space is given under the overlapping jaw of the clip a^5 to allow the conveyer to move freely, while the clip serves to guide it and prevent its displacement.

The interchangeable section *c'* of the burr C can be readily changed in grinding coarse and fine meal. In grinding corn in the cob, or for damp grain—such as oats, barley, &c.—I use a special form of teeth. (Seen in elevation, Fig. 8, and in plan view, Fig. 9.) In this form of teeth a long slope is used from the point of the tooth i^2 back, curving inward to nearly or quite a circular form in the gum at the base of the tooth-face *o*, as seen in the same figures. In operation the grain as it is ground (even if

quite damp) will work back around the curve and discharge under the point of the tooth, so that the groove *o* is kept quite clear and the burr cleans itself, freeing its teeth from the ground material. In grinding fine meal I use a different form of teeth, as shown in Fig. 10 in elevation and in Fig. 11 in plan view. This tooth consists of the very narrow square ribs i^3 with wide flat grooves *o'* between them. This form of tooth, while it readily reduces the grain to fine meal, also readily allows the ground material to discharge from the burr and will not clog.

The right to make application on the teeth of the burrs is reserved.

I claim as my invention—

1. In a grinding-mill having the running burr composed of a burr section or sections attached to a dome-plate or cap, and suspended from the latter on a central spindle, the combination, with the inner top flange of the burr-section having the flat rectangular lugs projecting therefrom, of the dome-plate having the exterior horizontal flange and provided with depressions in its convex surface and the bolts connecting said dome-plate and burr-section, whereby the latter is suspended wholly from said dome-plate and both longitudinal and transverse strain upon said connecting-bolts prevented, substantially as hereinbefore set forth.

2. In a grinding-mill, the combination of a case, a stationary burr within the latter, and a running burr composed of the two frustum-shaped sections, the upper section having niches to form the inner projecting lugs, the lower section having the inner projecting proximate lugs, bolts connecting the lugs of the two sections, with vertical lugs on one section engaging recesses in the other section, and the dome-plate insertible from within said running burr and connected by the means described with the upper frustum-shaped section of the latter, substantially as set forth.

3. In a grinding-mill, a stationary burr, a running burr within the latter, composed of a burr section or sections, and a dome-plate insertible through said burr section or sections, and from which the latter are suspended with the means of attachment, substantially as described, for the purpose hereinbefore set forth.

4. In a grinding-mill, the combination, with the running burr, the fixed or stationary burr, and the case having an exterior bottom flange provided with holes for its attachment, of the annular meal-trough having the perforated lugs *m'* and the bolts *a'*, securing said meal-trough, said stationary burr, and the case together, and a ring conveyer having radial blades located within said annular meal-trough, and having means thereon for connecting it with the running burr, said meal-trough being provided with a discharge-orifice, substantially as set forth.

5. The combination, with the annular meal-trough having the inner projecting top flange, the conveyer adapted to rotate within said annular meal-trough and having a top flange extending over the latter, and the spacing-clips secured to the flange of said meal-trough, each having a jaw extending over the flange of said conveyer, adapted to guide the latter and prevent its displacement, substantially as set forth.

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

JAMES S. WOODCOCK.

Witnesses:
JOHN E. DAVIS,
THOMAS J. SMITH.