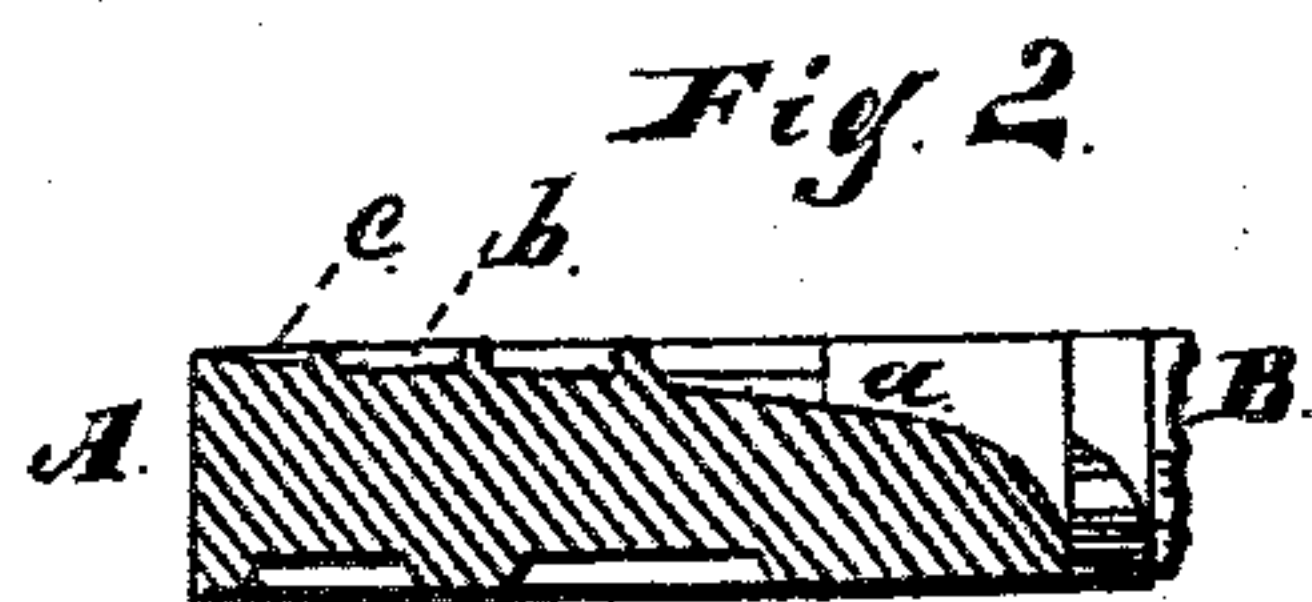
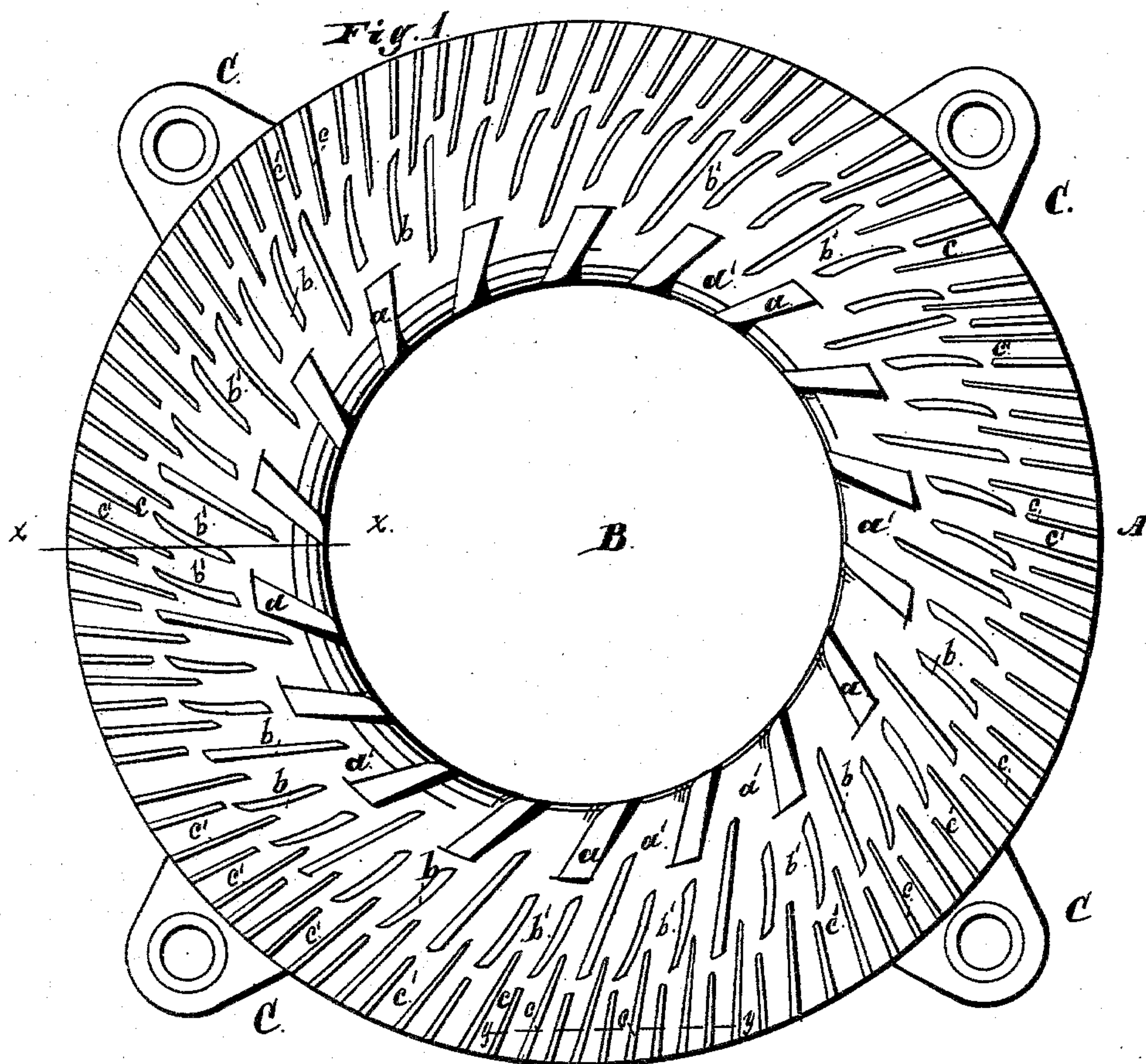


(No Model.)

E. S. HOWLAND.
METALLIC GRINDING RING.

No. 286,613.

Patented Oct. 16, 1883.



Witnesses:
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UNITED STATES PATENT OFFICE.

EDMUND S. HOWLAND, OF BATAVIA, ILLINOIS.

METALLIC GRINDING-RING.

SPECIFICATION forming part of Letters Patent No. 286,613, dated October 16, 1883.

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To all whom it may concern:

Be it known that I, EDMUND S. HOWLAND, residing at Batavia, in the county of Kane and State of Illinois, and a citizen of the United States, have invented new and useful Improvements in Metallic Grinding-Rings, of which the following is a full description, reference being had to the accompanying drawings, in which—

Figure 1 is a top or plan view; Fig. 2, a detail, being a section on line $x x$ of Fig. 1, showing the form and relative arrangement of the ridges or drifts; Fig. 3, a detail, being a section on line $y y$ of Fig. 1, showing the upper face of the ridges or drifts.

This invention relates to grinding-rings formed of an annular metallic disk having a central circular opening, and provided on its working-face with grinding ridges or drifts arranged in annular and tangential lines, with depressions or cuts between the ridges or drifts composing each of the series to form the feed drifts or passages.

The objects of this invention are to improve the form, construction, and arrangement of the grinding ridges or drifts and the feed drifts or cuts, and secure a better, more uniform, and equal distribution throughout the grinding-surface; to arrange the several series of grinding ridges or drifts in relation to each other so as to have them coact and give the material a free passage from the point of entrance to the point of discharge; to have each series of ridges or drifts perform its part or portion of the work of distribution, feeding, and grinding, and at the same time have them self-clearing in their action, so as to prevent the material from accumulating at any one point or becoming packed, and thereby produce and insure a constant and continuous operation; to have the operation of such nature that the material, when ground, will resemble in appearance the work done by burr-stones; to prevent injury to the grinding-surfaces in case the rings come in contact or run together on their working-faces, and to improve generally the operation of grinding by the use of this class of rings.

To such end my invention consists in providing the working-face of the grinding-ring with a dress consisting of the three annular

sets of ridges with intermediate passages, all formed and disposed as hereinafter described and claimed, and illustrated in the annexed drawings.

The feed ridges or drifts a are located at some distance apart, so as to leave a wide space between each of them, which space, a' , receives the material from the feed-opening B. These ridges are somewhat heavy, and stand tangential, as shown in Fig. 1, and the spaces a' have the faces or ends adjacent to the opening B curved or rounded to allow of the passage of the material readily into them, so as to be crushed or coarsely ground by the action of the ridges or drifts a .

The drifts or ridges b stand on a different tangent from the drifts or ridges a , the incline at which they stand in relation to the drifts a being straighter than the incline of the ridges a . These drifts or ridges b are arranged in relation to the drifts or ridges a so that three of them will occupy the space from one ridge a to another, so that the entire series of ridges b will be made up of separate series of three each, and the ridges forming these separate series have their inner ends or termini arranged on an inclined line, the one which has its inner end in line, or nearly so, with the ridge a being the shortest, and its inner end terminating at a point farther removed from the circle on which the outer ends of the ridges a terminate, and the other two ridges or drifts b belonging to these separate series have their inner ends extending inward so as to bring the end of the longer drift or ridge within the space a' , between the ridges a , and the intermediate one in line, or nearly so, with the circumference of the circle of the outer ends of the ridges or drifts a . The form of these ridges or drifts b , and their arrangement in relation to each other and to the ridges or drifts a , is shown in Fig. 1, from which it will be seen that the outer ends of the ridges or drifts a and the inner ends of the ridges or drifts b do not conjoin, but have a distinct line of separation between them, leaving a passage for the travel of the material from between the spaces a' to the spaces b' . These ridges or drifts b in width are narrower than the ridges or drifts a , and in height are shallow, so as to form a shallow space or passage, b' , between them, which pas-

sage forms the feed cut or passage for the material to be ground by the action of the ridges or drifts *b*.

The outer or third series of ridges or drifts, *c*, is composed of alternate long and short ridges or drifts, as shown, the short ridges being in line, or nearly so, at their inner ends with the outer end of one of the ridges *b*, and the longer ridges occupying the space between two of the ridges *b*, its inner end terminating on the line or nearly on the line of the circle on which the upper ends of the drift *b* are located. These drifts or ridges *c* are also narrow in width and shallow in depth, and the spaces *c'* between them are also shallow, but have considerable width. The side face of these ridges which is against the rotation of the ring is curved slightly, the opposite face being straight, and these ridges or drifts *c* stand on a slightly-different tangent from that of the ridges or drifts *b*, and they are so arranged in relation to the drifts or ridges *b* as to break the line of continuity and leave a space or passage through which the grain or material can pass to be finished by their action.

The face or bottom of each space *b'c'* between the ridges or drifts *b c* is flat or in a horizontal plane, so as to leave a smooth, even surface over which the material can pass, and these spaces being very shallow the action of the ridges or drifts in doing the grinding is such as to cut or grind the meal flat, giving the meal, when finished, the appearance of work done by burr-stones, instead of a round appearance, as is the case with the ordinary form and arrangement of ridges or drifts now in use; and the spaces between these ridges or drifts *b c* being very shallow, and at the same time of considerable width, the material will be ground very fine, and will not be liable to become clogged or wedged in between the ridges or drifts, the width of space allowing a free passage and obviating the danger of clogging, as is the case where these spaces between the drifts are narrower and deeper, the material having plenty of room to spread out without becoming packed.

The upper faces of all the ridges or drifts *a b c* are left flat or on a horizontal plane, so that in case the rings run together, or their working-faces come in contact from any cause, no injury will result, as the smooth flat faces of the grinding-ridges will simply pass each other without chipping or breaking out pieces, as would be the case if their top or upper face were left sharp.

In operation, the material is first crushed or coarsely ground by the action of the drifts or ridges *a*, and passes from these ridges into the spaces *a' b'* to the ridges or drifts *b*, and the arrangement of the drifts or ridges *b* in relation to the drifts or ridges *a* is such that the material has a straight or nearly straight line of travel from one ridge to the other, and in case any part or particle or any portion is deflected from a straight line and passes the

outer ends of the ridges or drifts *a* such portion will pass between the outer ends of the ridges *a* and the inner ends of the short ridges *b*, which are in line, or nearly so, therewith, and be caught by the next succeeding ridge *b* and pass into the space between it and the short ridge with a straight line of travel. From the ridges or drifts *b* the material passes to the outer series of ridges, *c*, which ridges are arranged in such relation to the ridges *b* that the material will have a straight line of travel between these two series of ridges, and will pass from the spaces between the ridges *b* into the spaces between the ridges *c*, from which space it will be discharged at the periphery of the ring in a ground condition. By this arrangement it will be seen that the material is distributed from one series of ridges to the other in the manner best adapted for grinding, and that in its passage it will not become clogged or packed between the ridges, but will pass freely from one series of ridges to the other by reason of the wide spaces left between the ridges; that the material, when ground, will present a better appearance, and the grinding will be performed in a better manner by reason of the shallow cuts or passages between the ridges; that these passages facilitate the operation both in distributing and grinding, as they allow a wide space in which the material can move; that the breaking of the continuity of the drifts by leaving a clear line of separation between the several series enables the material to travel from one series to another in a straight or nearly straight line, and in case of deflection the deflected portion will be caught and carried in without being carried around by the rotation of the ring; and that by thus combining these several features of feeding, distributing, and grinding, the operation of the ring as a whole is greatly improved, and the capacity for grinding is largely increased.

The rings or disks, constructed as herein described, are intended to be used either in horizontal or vertical disk-mills, and in either event the rings are of substantially the same construction. In order to securely hold the rings or disks in proper position, they are provided with lugs or ears *C*, having perforations for the passage of screws or bolts. Inasmuch as my invention is only directed to improvements in the dress of the ring or disk, I do not deem it essential to illustrate the same applied to a mill of any particular construction.

What I claim as new, and desire to secure by Letters Patent, is—

1. A metal grinding-ring provided upon its working-face with a dress consisting of an inner set of tangential feed-ridges, *a*, commencing at the eye of the stone, a second annular set of long and short ridges, *b*, arranged with the shorter ridges in pairs, and the longer ridges, which are intermediate of said pairs, extending inwardly between the ridges next to the eye, and a third outer annular set of alternate long and short ridges, *c*, arranged at

the skirt of the stone, with the longer ridges extending inwardly between the ridges *b* of the middle set, substantially as described.

2. A metal grinding-ring provided with a
5 dress consisting of three annular sets of ridges, *a*, *b*, and *c*, of which the tangential ridges *a* are next to the eye, and the passages *a'* between the said ridges deepened at their inner
ends, the ridges *b* being arranged in pairs of
10 short ridges with longer ridges intermediate of said pairs extending inwardly into the

passages *a'*, and the outer set of ridges, *c*, being composed of alternate long and short ridges, with the long ridges extending inwardly between the ridges of the middle set, 15 which latter are formed more closely to radial lines on the face of the ring than the ridges *a* of the inner set, substantially as described.

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